

# Pectoralis Major Muscle Tear Diagnosed with Magnetic Resonance Imaging and Ultrasound—A Case Report

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## ABSTRACT

Traumatic tears of the pectoralis major muscle are rare, but they are becoming more prevalent as the numbers of both professional and recreational athletes increase. Pectoralis major injuries typically occur in active individuals who do manual labor or participate in sports. Wightlifting is by far the most common sport associated with pectoralis major ruptures. Diagnosis can usually be made based upon history and physical examination; however, ultrasound and magnetic resonance imaging are helpful tools in diagnosis and pre-operative planning. Specific treatment options should be based upon the severity of the injury and the patient's individual needs. Initial post-injury immobilization and subsequent physical therapy can contribute to a patient regaining full shoulder motion and being able to conduct normal daily activities. Surgery with repair of the pectoralis major rupture is able to restore normal chest-wall contours and muscular strength. (*Tzu Chi Med J* 2005; 17:441-444)

**Key words:** pectoralis major tear, atrophy, MR imaging, ultrasound

## INTRODUCTION

Traumatic tears of the pectoralis major muscle are becoming more popular. Knowledge of the clinical presentation, diagnosis and treatment of the pectoralis major muscle injury is becoming more important. Imaging such as ultrasound and magnetic resonance imaging are playing an important role in the diagnosis.

## CASE REPORT

A 52 year-old man, who engaged in sports every day, suffered from sudden pain in the right anterior chest wall, accompanied by a popping sound, when he was forcibly pulled out of a river by the arm. The incident

caused swelling of the chest wall and significant reduction of the muscle strength of the affected right arm. Ten days later, soft-tissue ultrasound (Fig. 1) and MR images (Fig. 2,3) revealed a massive partial tear over the musculotendinous junction of the sternal head of the right pectoralis major muscle, with an associated hematoma. The hematoma was at a late subacute stage as revealed by its hyperintense signal intensity on both T1- and T2-weighted images. Deformity of the right anterior chest wall was noted about three months later. The patient insisted on undergoing a surgical procedure four months after the injury to treat injury-elicited cosmetic problems, and to restore his pre-injury muscle strength since he wished to remain active and participate in sports. Surgical findings revealed a massive partial tear of the sternal head of the pectoralis major muscle. Fibrosis and adhesions in the muscle were also noted. A plantaris

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Fig. 1. Ultrasound of the right side of the chest shows a hypoechoic shadow over the musculotendinous junction of the pectoralis major compatible with muscle retraction (long arrow) after tearing, with a hematoma (short arrow).

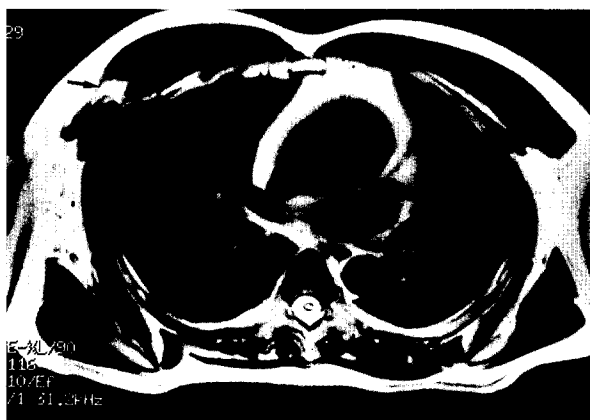


Fig. 2. T2-weighted image shows a 3 x 1.5 cm hyperintense shadow (arrow) over the musculotendinous junction compatible with massive partial tear of the pectoralis major.

tendon graft repair was performed. Following surgery, the patient regained his pre-injury chest-wall contour but had only partial recovery of his former muscle strength. During the twelve-month period subsequent to surgery, this patient experienced gradual, progressive re-emergence of a mild deformity of his chest wall and, one year after surgery, he reported that he had still not completely recovered his muscle strength. This patient indicated that prior to his injury, he was able to perform 60 push-ups over 2 minutes, but one year after surgery, he was only able to perform 20 push-ups, because of mild chest pain during exercise. Follow-up MR imaging (Fig. 4) revealed focal atrophy of the pectoralis major

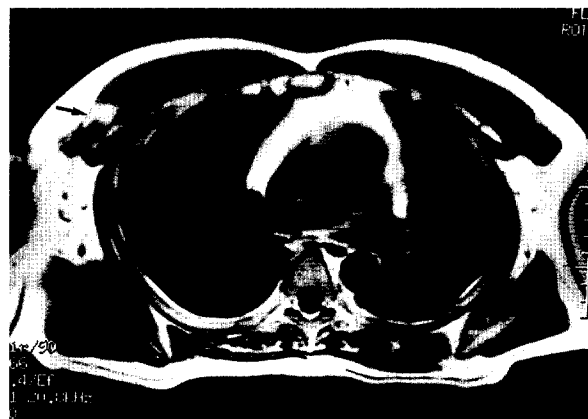


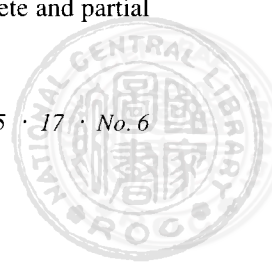
Fig. 3. T1-weighted image shows a nearly 3 x 1.5 cm hyperintense shadow (arrow) over the musculotendinous junction of the right pectoralis major muscle compatible with massive partial tear with a hematoma at a late subacute stage.

muscle with associated fatty changes. No recent re-tear of the pectoralis muscle has been reported.

## DISCUSSION

Avulsion of the pectoralis major muscle results in sudden pain in the arm and shoulder at the time of injury, with subsequent swelling, ecchymosis, and functional pain [1]. Upon clinical examination, the patient may exhibit a palpable defect along the course of the pectoralis major muscle and marked asymmetry of the affected muscle in comparison with the contralateral muscle [1]. Tears of the pectoralis major muscle tend to occur during powerful eccentric contraction of the muscle, at which time the muscle is subject to concomitant forceful stretching [2]. Most injuries of the pectoralis major muscle have been reported in male weight lifters or other athletes involved in contact sports [3-6]. Ruptures typically occur at the musculotendinous junction or the tendon insertion to the humerus [3-4,7-9]. Intrastance tears of this muscle can be caused by direct trauma, which may occur in contact sports, although partial tears are more common than complete tears [10]. Partial tears typically occur at the musculotendinous junction, whereas complete tears tend to occur more frequently at the tendon-bone interface [11]. Rupture of the sternal head tends to occur more frequently than rupture of the clavicular head [8].

Magnetic resonance imaging is a helpful tool for pectoralis muscle injury diagnosis. Axial images are useful for distinguishing between complete and partial



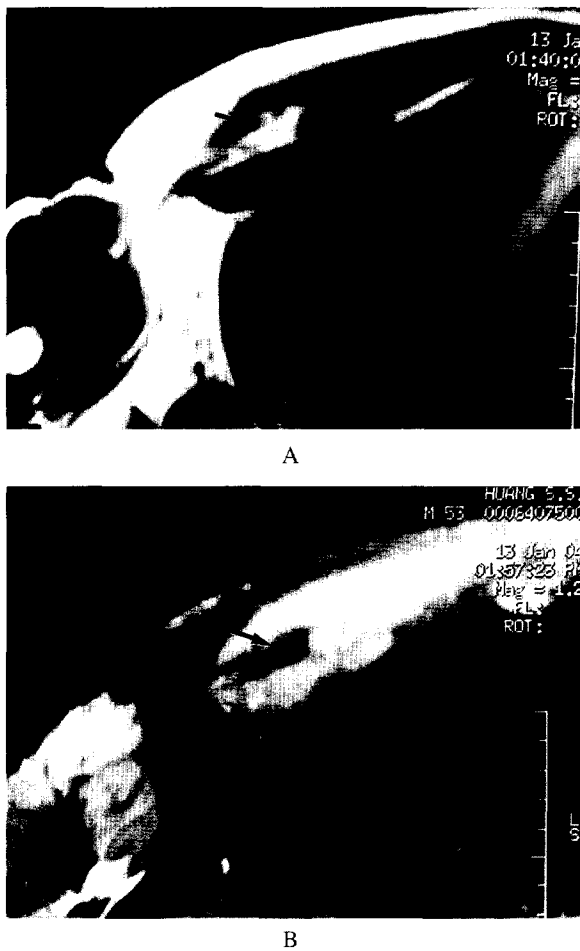


Fig. 4. Post-operative MR image shows focal fatty changes in the muscle over the repair region. (A) T1-weighted image shows a focal hyperintense shadow (arrow) in the right pectoralis muscle near the repair region. (B) Fat-saturation T2-weighted image shows a hypointense shadow (arrow) in the right pectoralis muscle near the repair region.

tears of the pectoralis muscle [10]. Fluid-sensitive sequences such as fat-suppressed T2-weighted images or STIR are useful for detecting injury-associated edema or fluid collections [11]. Ultrasound is an appropriately sensitive imaging modality for the detection of most muscle tears including those in the pectoralis major, and it is also reasonably convenient, although the relative benefits are operator dependent [12]. Ultrasound is less expensive than MR imaging. Ultrasound and magnetic resonance imaging show the location, size and gap of the muscle tear and are helpful in pre-operative planning. The anatomical form of the pectoralis major muscle describes a crescent-like origin from the clavicle, sternum, and the sixth and/or seventh costal cartilages, revealing

a trilaminar division of the muscle fibers, which twist 90 degrees before uniting to form the tendinous insertion to the humerus, lateral to the bicipital groove. The lower muscle fibers insert superiorly and posteriorly to the upper fibers [6]. MRI does not usually show these separate layers.

The appropriate treatment of a complete tear of the pectoralis major muscle is somewhat controversial. Conservative treatment usually results in the return of good muscle strength and normal range of motion. Surgical repair is recommended for high-performance athletes or athletic individuals who wish to participate actively and frequently in strenuous sports [3-4,7-8,13]. Full strength is not typically restored following conservative treatment of complete pectoralis muscle tears [3,7,14], however, conservative treatment may not result in a substantial functional loss. Furthermore, conservative treatment is advocated for inactive or older patients with small or partial tears of the muscle [3,11]. Early surgical repair tends to produce the best cosmetic results and functional return of full strength in young, athletic individuals [3,6,15]. Following surgical repair to the muscle, relief from injury-related pain, full recovery of strength, correction of cosmetic deformity, and maintenance of normal range of motion may be expected in the majority of patients. For our patient, focal atrophy of the pectoralis muscle was responsible for the incomplete recovery of muscular strength, and a mild deformity did recur in the chest wall. Post-operative follow-up MR imaging revealed focal atrophy with fatty changes in the pectoralis major muscle. Technical problems due to fibrosis and adhesions in the muscle associated with the patient's medical treatment delayed his surgery, possibly resulting in focal atrophy of the pectoralis muscle.

We report on a rare case of a massive partial tear of the pectoralis major muscle caused by forceful pulling of the arm. To the best of our knowledge, this type of injury mechanism has not been reported previously in the English literature. Early surgical repair is suggested to avoid adhesions, muscle scarring, fibrosis, and atrophy. Chronic injury presents a greater surgical challenge due to retraction and scarring that arises subsequent to muscle tearing. Physical therapy may help patients regain some range of shoulder motion and muscle power, enabling them to perform normal daily activities. Although most surgeons prefer to repair the ruptured muscle in the acute setting, outcomes of surgical repair of chronic ruptures may show excellent results with regard to chest wall contour, muscle function and strength [16]. Ultrasound and magnetic resonance imaging are excellent imaging modalities for detecting tears of the

pectoralis major muscle and follow-up investigation post-surgery.

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## 以磁共振攝影及超音波掃描診斷胸大肌斷裂—病例報告

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### 摘要

胸大肌裂傷是少見的創傷，然而因職業性及娛樂性運動的增加而越來越普遍，舉重是引起胸大肌裂傷最常見的運動。診斷常常依據病患的病史及生理檢查，然而超音波掃描及磁共振攝影是提供診斷及手術前計畫的好工具。治療方式依胸大肌裂傷的嚴重性及病患的各別需要而定。傷後的固定及接著的物理治療可完全恢復肩膀運動及日常生活的能力，而手術治療大部分病患都可恢復胸壁外觀及肌力。(慈濟醫學2005; 17:441-444)

**關鍵語：**胸大肌裂傷，萎縮，磁共振攝影，超音波掃描

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