

Surgical approach to acute *pectoralis major* tendon rupture

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SUMMARY: Surgical approach to acute *pectoralis major* tendon rupture.

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Pectoralis major rupture is a very uncommon injury first time described by Patissier in 1822. Tears are classified on the type (partial and complete) or on the site (tendinous, myotendinous junction, intramuscular). Ruptures are reported in young high-performance athletes as results of eccentric contractions of the musculotendinous unit. The most probable mechanism in elderly patients is a brisk tearing movement applied to stiff atrophic muscle. Injuries generally involve the sternal portion; the localization to the clavicular portion is rare and can be misdiagnosed as muscle sprain.

Preoperative planning include MRI as gold standard regarding operative versus non operative treatment decisions. Surgical repair is recommended in cases of complete tears because of loss of strenght in adduction, flexion and internal rotation.

Aim of the current study is to describe the surgical repair of acute *pectoralis major* tendon rupture in 5 patients. Surgery was performed through a modified delto-pectoral approach; *pectoralis major* tendon was attached at its anatomic insertion using two metallic anchors. The patient as been immobilized in a sling for 30 days and then assisted physiotherapy begun; strenght exercises were allowed at 90 days.

At a mean follow-up of 24 months results were excellent in all cases with restoration of strenght and coming back to previously sports activity.

RIASSUNTO: Trattamento chirurgico delle rotture tendinee acute del gran pettorale.

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La rottura del gran pettorale è una lesione poco comune descritta la prima volta nel 1822 da Patissier. Le lesioni sono classificate in base al tipo (parziali e complete) e alla sede (tendinee, giunzione muscolo-tendinea, intramuscolari). Le rotture sono frequenti nei giovani atleti con alte prestazioni muscolari per effetto della contrazione eccentrica dell'unità muscolo-tendinea. Il meccanismo lesivo più probabile nei pazienti anziani è invece un brusco movimento applicato al muscolo rigido e atrofico. Il trauma generalmente interessa la componente muscolare sternale; i rari casi che coinvolgono la porzione clavicolare possono essere erroneamente diagnosticati come stiramenti muscolari.

La RMN rappresenta la metodica elettiva preoperatoria per la scelta del trattamento conservativo o chirurgico. Le lesioni complete richiedono un trattamento chirurgico perché determinano perdita di forza in adduzione, flessione e rotazione interna.

In questo studio descriviamo 5 casi di riparazione chirurgica di lesioni acute del tendine del gran pettorale in 5 pazienti giunti alla nostra osservazione. Attraverso un approccio chirurgico deltoideo-pettorale, il tendine è stato reinserito alla sua sede anatomica con due ancore metalliche. Nel postoperatorio il paziente è immobilizzato per 30 giorni prima di iniziare la fisioterapia. Gli esercizi di forza sono concessi a 90 giorni.

I risultati ad un follow-up medio di 24 mesi sono stati eccellenti in tutti i casi con recupero della forza e ritorno alla precedente attività sportiva.

KEY WORDS: *Pectoralis major* - Rupture - Surgery.
Gran pettorale - Rottura - Chirurgia.

Introduction

Rupture of *pectoralis major* muscle is a very uncommon injury with fewer than 180 cases reported in the world literature (1-3). Tears are classified on the type (partial and complete) or on the site (tendinous, myotendinous junction, intramuscular) (3, 4) and have been described almost exclusively in young men weight lifters and high-performance athletes as results of ec-

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centric contraction of the musculotendinous unit (5-8). Rare cases occurred when resisted forces are applied to the extended and abducted arm (9-12).

The most common rupture involves the sternal portion (3, 5); when the clavicular portion of the muscle is intact, injuries can be misdiagnosed as a muscle sprain (1, 10, 13, 14). Mild strains and partial tears located within the muscle belly are treated conservatively (6); complete tears predominate at the enthesis (3, 15, 16).

Surgical treatment is strongly recommended in cases of total or sub-total rupture because of loss of strength in adduction, flexion and internal rotation; an untreated injury may also disrupt axilla profile (2, 5, 6, 15, 17, 18).

The purpose of the current study is to describe the surgical repair of acute *pectoralis major* tendon rupture in a case series of young patients. Clinical results are reported at a mean follow-up of 24 months.

Patients and methods

Five patients with *pectoralis major* muscle rupture have been seen at our Unit of Shoulder and Elbow Surgery between February 2004 and January 2007. All of the patients but one were athletes with a mean age of 31 years. Body builders and rugby player referred ruptures took place on bench presses, while a direct incident involving shoulder area was reported in the other 2 cases. The tendon tears were complete and surgically treated within 15 days (Tab. 1).

Clinical examination showed ecchymosis of the axilla and upper arm with deformity of the pectoral area due to retraction of the muscle belly (Fig. 1). The active contraction of the pectoralis muscle highlighted the deformity. Preoperative investigations included shoulder X-ray trauma series ("true" AP; outlet view, axillar view) and Magnetic Resonance Imaging (MRI) (Fig. 2).

Results of the treatment were assessed at a mean follow-up of 24 months (min 12 - max 40), using the criteria reported by Ääri-maa et al (6):

- excellent: arm and shoulder reported as asymptomatic; adduction and flexion strength > 95% of the control value with normal range of motion; return to same level of sports activity;
- good: arm and shoulder almost normal and asymptomatic; strength of the arm > 70% of the control value with no loss of motion; slight cosmetic defect recorded;
- fair: arm with symptoms of pain and/or weakness; strength

TABELLA 1 - DATA OF THE PATIENTS WITH PECTORALIS MAJOR MUSCLE INJURY ENROLLED IN OUR STUDY.

Pz	Sex	Age (years)	Sport/Job	Dominant arm	Injury to surgery (days)
1	M	40	Body builder	No	10
2	M	30	Body builder	No	12
3	M	35	Soccer player/carpenter	Yes	16
4	M	23	Rugby player	Yes	7
5	M	29	Basket player	Yes	8



Fig. 1 - Clinical examination of shoulder girdle shows ecchymosis of the axilla and upper arm. Pectoral area appears deformed due to retraction of the muscle belly.



Fig. 2 - MRI: complete "full tendon" tear of the *pectoralis major* muscle.

- of the arm < 70% of the control value or there was considerable loss of motion; outcome cosmetically unacceptable;
- poor: permanent inability to return to work; complication requiring reoperation; initially conservative treatment failed and the patient was later operated on;

Surgical procedure

Patient was placed in a beach chair position under general anesthesia and anesthetic block of brachial plexus with the affected arm free to abduct and rotate. Through a modified delto-pectoral approach extended distally to the proximal humerus shaft, we exposed delto-pectoral interval and we retracted deltoid muscle and cephalic vein laterally. The tendon was prepared free of scarring adhesences and the muscle belly was mobilized on all sides, pulling it laterally to restore the proper length (Fig. 3).

The muscle, reinforced by a Marlex net, was attached with 2 Super-Revo® anchors (ConMed Linvatec, Largo, FL) at its anatomic insertion on the lateral lip of the biceps groove using Mason-Allen and mattress sutures (Fig. 4).

Postoperatively the arm was immobilized in a sling for 30 days and then begun passive mobilization except for abduction and external rotation that were allowed at 45 days in water pool. Isometric exercises were suggested at 60 days and strength exercises at 90 days.



Fig. 3 - *Pectoralis major* tendon is mobilized free of scarring adhesions and the muscle pulled laterally. We used a Marlex net to reinforce the musculotendinous junction.



Fig. 4 - *Pectoralis major* muscle is anatomically attached on the lateral side of the biceps groove.

Results

X-ray excluded humeral bone avulsion and MRI confirmed the diagnosis of complete tendon rupture (Fig. 1). According to the criteria described, results were excellent in all cases; the arm was reported as asymptomatic with complete range of motion and restoration of the strength coming back to previously sports activity.

Discussion

The first patient with *pectoralis major* ruptures was described by Patissier in 1822 (19). Since then the tears have been reported in the form of case reports or case series (4, 6, 7, 12, 13, 18, 20-30). We found only one case of this injury in women (3) and the reason for this

discrepancy remains unclear (6, 18). Anabolic steroids could be implicated in tendon ruptures because of the fast buildup of muscular tissue and strength that exceeds the adaptive capacity of tendons, leaving them susceptible to injury (5, 31-33). Evidence of steroid doping has been reported in 12 cases of pectoralis tendon ruptures (6). None of our patients referred steroids use for their performance. Beloesesky Y et al (34), describe clinical features of pectoralis major rupture in elderly patients compared with younger patients; the most probable mechanism of injury was a brisk tearing movement applied to stiff, atrophic muscle during nursing procedures of transferring, positioning and dressing. The authors suspect that the injury is more common than reported and, although surgical repair is not required, a correct diagnosis is important for its clinical impact necessitating care and follow-up. MRI scans identify tears by their appearance and site as complete (full tendon), high-grade partial tear (more than 50% tendon) or a low-grade partial tear (less than 50% tendon) (3), and provide useful information regarding operative versus non operative treatment decisions. In the current paper MRI findings were correlated with clinical examination in order to plan the final treatment. Hanna et al. (2) reported a greater recovery of strength and work performed after surgical repair than conservative treatment. Scott et al (17), recommend initial conservative management; if symptoms persist, dynamometry is helpful to select patient for a late repair. Wolfe et al (5) suggest a surgical repair for acute complex tears in patients who require higher strength activities. Jones and Matthews (13) conclude that exploration and repair within one week gives best results. Although has not been reported significant subjective or objective differences between the patients treated surgically for acute (within 2 weeks) and chronic injuries (18), we consider the early diagnosis and repair as ideal. Schachter et al (35), describe a reconstruction using a smitendinosus-gracilis autograft in failed primary repair for pectoralis major tendon ruptures. In our experience an anatomic repair has been performed for the minimal myotendinous pectoralis retraction. We do agree with authors who suggest a conservative management of partial tendon tears (36).

Immobilization for 1 month is required for tendon healing, then begin passive physiotherapy. We suggest to test muscle tone in water pool with soft isometric exercises at 45 days. Strength exercises must begin at 90 days to restore a complete athletic performance.

Conclusions

Surgical approach is the treatment of choice for complete pectoralis major tendon ruptures. In the last

20 years there has been a significant increase in the number of ruptures associated with participation in athletic endeavors as the number of athletes in both the professional and recreational sectors increases. Ruptures in elderly patients have been related with nursing procedures for transferring, positioning and dressing the patients.

MRI is the gold standard to identify and classify the tears allowing surgeon to decide the treatment. Partial tears in younger and complete tears in elderly patients can be treated conservatively. Surgical reconstruction is recommended in high-performance athletes with complete tears; anatomical repair in the acute phase guarantee the best results.

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