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Case Reports / Olgu Sunumu

Pectoralis major muscle total rupture in a body builder

Bir vücut geliştiricisinde pektoralis majör kası total rüptürü

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ABSTRACT

Although pectoralis major (PM) muscle rupture is a rare injury it was reported frequently in recent years. Although there are few studies reporting that surgical treatment is superior, there is no clarity about the choice of treatment methods for pectoralis major muscle tears. Herewith, a total rupture of pectoralis major muscle case has been reported who was treated with conservative methods.

Keywords: *Athletic injuries, conservative treatment, pectoralis major muscle*

ÖZ

Pektoralis major (PM) kas rüptürü nadirdir, fakat son zamanlarda daha sık bildirilmektedir. Cerrahi tedavinin üstün olduğunu gösteren az sayıda çalışma olmasına rağmen pektoralis majör kas yırtıklarında tedavi yöntemlerinin seçimi net değildir. Burada pektoralis majör kasının tam yırtığı olan olgunun konservatif yöntemlerle tedavisi rapor edilmiştir.

Anahtar Sözcükler: *Spor yaralanmaları, konservatif tedavi, pektoralis major kası*

INTRODUCTION

The pectoralis major (PM) muscle consists of two heads; the clavicular and the sternal head. The clavicular head originates from the clavicle and the superior sternum. The sternal head originates from the distal end of the sternum, the external oblique fascia, and the cartilages of the first six ribs. These fibers cover and rotate 90° onto each other before uniting to form the tendinous insertion to the humerus, lateral to the bicipital groove (1,2). The PM muscle performs abduction, internal rotation and flexion of the humerus and also provides dynamic stabilization of the shoulder (1).

PM total muscle ruptures are rare, but were reported to be more frequent in body builders, recently (3). Surgical treatment is often recommended for complete ruptures of the pectoralis major muscle (4). In this manuscript, a case with PM total rupture and his treatment in a body builder has been reported.

CASE REPORTS

A 28 years old male body builder appointed to our sports medicine outpatient clinic due to a severe 'pop' sound from his right shoulder (dominant extremity) during bench-press exercise. He participated in professional wrestling for 10 years and bodybuilding for the last 11 years. He regularly trained for 1-2 hours 5 days a week. He did not have any chronic diseases and any prior musculoskeletal injuries. He had no previous history of surgery.

On physical examination, there was extensive ecchymosis on the inside of the right upper extremity, moderate tenderness, swelling and palpable deformity in front of the chest (Figure 1). Range of motion at the final angles of abduction and flexion were painful. The visual analogue score (VAS) pain score was 2/10. Resistive muscle examination of PM was painful and deformity was evident (Figure 2). The patient had a history of steroid intake during the last four years. He was questioned about his recent drug use history in detail. He used trenbolone enanthate (200 mg) 10 weeks before his injury. This injury occurred in the 2nd week of testosterone cypionate (900 mg/w) and boldenone (600mg/w) administration. The patient's X-ray was normal. Magnetic resonance imaging (MRI) was requested to clarify the diagnosis. MRI of the chest and shoulder demonstrated PM muscle fibers are retracted to the medial and it was evaluated as a full-thickness tear (Figure 3). This injury was determined to be type 3C according to the Tietjen classification (5).

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Figure 1. Rupture of pectoralis major muscle tendon in the right shoulder

Figure 2. Loss of axillary contour, demonstration of asymmetric retraction and moderate edema on the right chest with isometric pectoralis major muscle contraction.

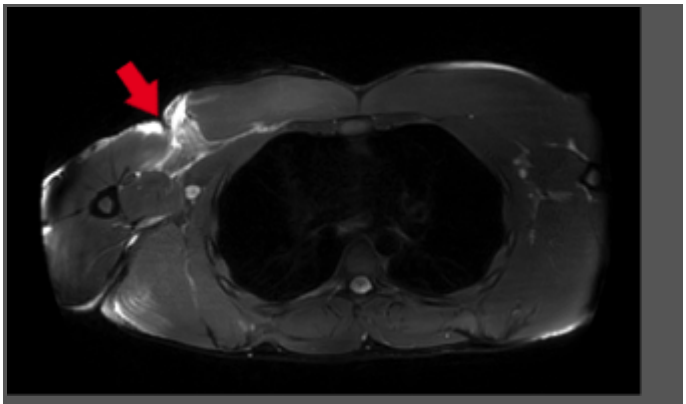

Figure 3. In the right pectoralis major muscle, there is a full-thickness muscle tear starting from the musculotendinous junction in the lateral part and extending to the proximal part of the tendon (arrow head). Bleeding between muscle fibers and fascia and are noted along with soft tissue edema in the armpit area.

Treatment

Although the orthopedic surgeon suggested surgery, the patient did not accept surgical treatment and asked for the conservative approach. Daily use of mucopolysaccharide polysulfate gel (three times a day) and diclofenac diethylamine gel (three times a day) were advised during the first two weeks. To minimize arm movements, arm sling has been applied with internally rotated position of the arm for two weeks. A rehabilitation program consisting of joint range of motion exercises, arm and shoulder stretching and isometric strengthening was implemented until pain free daily living activities has been established (Table 1). The average pre-injury bench-press load of 220 kg was reduced to 160 kg after treatment. The patient showed improvement in clinical symptoms with this treatment, but mild deformity at the muscle lateral border of the anterior chest surface remained (Figure 4). On MRI after rehabilitation, improvement has also been observed in the PM muscle (Figure 5).

The patient has been informed about the case report and he signed consent form.

Table 1. Rehabilitation of Pectoralis Major Muscle Rupture

Week	Exercises	Set x Repetition, Frequency during the day
0-2	Sling immobilization for 2 weeks Passive rest for full 2 weeks	
2-4	Early passive ROM exercises (increasing 5 degrees per week) • *Flexion: 0°-45°* • *Extension: 0°* • *Abduction: 30°* Scapular mobilization Pendulum exercises; forward and backward Begin gentle isometrics to shoulder / arm Isometric exercises of chest and upper body	2x10, 3 times / day 3x10, 2 times / day 2x20, 3 times / day 2x20, 3 times / day 2x20, 3 times / day
4-6	Active scapular isotonic exercises Aggressive passive ROM and isometric contraction	
6-12	Active assist ROM and isotonic contraction Gradually increase muscle strength and endurance	3x15, 3 times / day 2x10, 2 times / day
12-16	Full shoulder ROM • *Shoulder flexion to 180°* • *Shoulder abduction to 180°* • *Shoulder external rotation to 105°* • *Shoulder internal rotation to 65°* Progress strengthening exercises with exercise band and dumbbell Sub-maximal plyometric training Neuromuscular training	3x15, 2 times / day 3x15, 2 times / day
16-20	Continue to progress functional activities of the entire upper extremity Gradually introduce sporting activities • Mile machine weight training; chest press • Chest press within 60° and low to moderate intensity • Deltoid and biceps strength exercise with machine • Gradually increase bench press with machine	3x 20, 2 times / day
>20	Power training for return to sports Power training; adduction and internal rotation Plyometric training	2 x 15, 2 times / day

ROM: *Range of motion.*

DISCUSSION

Ruptures of the PM are reported mainly in individuals engaged in weight training activities, specifically during the bench press exercises. During the bench press, the arms are abducted and rotated outward, the PM muscle is stretched and contracts concentrically. As the weight moves downward, the PM muscle prevents it from falling on the chest and contracts eccentrically. During both movements, the PM muscle is not relaxed, and injury can result if this movement is not coordinated due to fatigue or weakness (6,7).

The overall incidence of PM rupture in the general population is unknown, and less than 400 cases have been described rupture of the PM muscle. These cases are thought to be associated with increased participation in weightlifting, bodybuilding and contact sports, increased use of anabolic steroids, and increased awareness of this injury (8,9). PM rupture occurs predominantly in young men aged 20 to 50 years (10).

The plain radiographs have limited role in detecting PM ruptures, unless there is a bony avulsion. However, MRI is the preferred imaging modality for the diagnosis of tears and in treatment plan. Standard shoulder MRI will not be sufficient to fully identify or characterize a PM tear, as most sequences will not extend caudally enough to include the tendinous insertion. A dedicated sequence is required with axial slices extending superiorly from the quadrilateral space and inferiorly to the deltoid tuberosity along with coronal oblique cuts (4,11).

Figure 4. Mild deformity in lateral side of pectoralis muscle after treatment

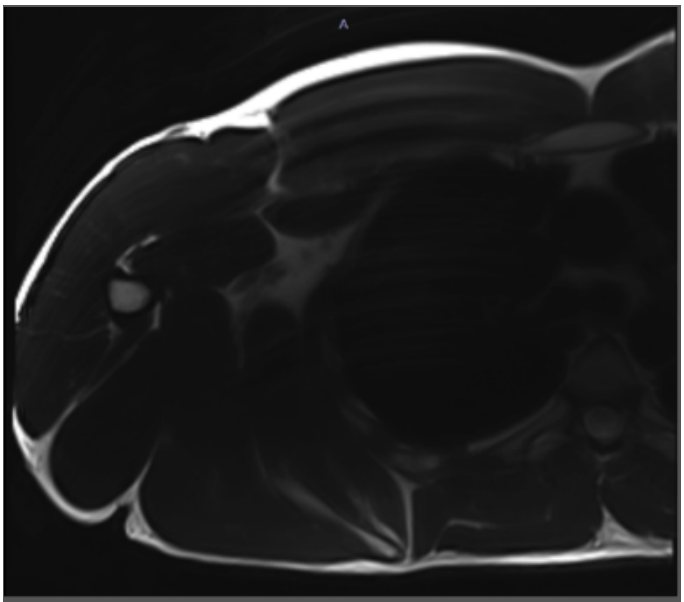

Figure 5. MRI (Magnetic resonance image) of pectoralis muscle after treatment

Anatomical classification of PM muscle injuries was suggested by Tietjen in 1980 for the purpose of making conservative versus surgical treatment recommendations. It described the extent and location of PM injury. Contusions or sprains are classified as type 1. A partial tear is classified as type 2 and a complete tear is type 3. Type 3 can be further subclassified into a muscle origin rupture (3A), muscle belly rupture (3B), musculotendinous junction rupture (3C), and muscle tendon avulsion (3D), (5). A further subclassification was suggested by Bak et al., for bony avulsion from the insertion (3E) and muscle tendon substance rupture (3F), (Table 2) (6).

Table 2. Tietjen's and Bak classification of pectoralis major injuries

Type	Injury pattern	
1	Contusion or sprain	*T*
2	Partial tear	*I*
3	Complete tear	*E*
3-*A*	Muscle origin	*T B*
3-*B*	Muscle belly	*J A*
3-*C*	Musculotendinous junction	*E K*
3-*D*	Tendinous insertion	*N*
3-*E*	Bony avulsion from insertion	
3-*F*	Muscle tendon substance	

Conservative treatment is primarily recommended for PM body ruptures, for elderly patients and patients who do not want to have surgery. Although there are patients who were successfully treated with the conservative method, the literature mostly supports the surgical treatment method for active individuals (12). According to the authors, early surgical intervention and anatomical repair are a general trend in pectoralis major total ruptures. This trend affects surgeons and patients' treatment choices. In conservative treatment, the affected limb is placed in a shoulder sling (arm in adduction and internal rotation) supported by an elastic bandage to prevent edema and hematoma and if there is pain, analgesic medication may be recommended. Passive exercises can be started immediately as tolerated, followed by active assisted and active exercises for 6 weeks. After that, resistance exercises can be applied and free activity is allowed after 2-3 months (13,14). Adduction and internal rotation strength can be regained, vigorous upper extremity demanding activities at high level can be resumed, and a satisfactory cosmetic result is likely (6).

In a case series, six athletes who developed pectoralis major muscle rupture were reported among bodybuilders using steroids (15). All of these cases were male and the mean age was 29 years. According to Tietjen classification, five cases were type 3D and one case was type 3C injury. All of these patients underwent surgical repair. It was reported that patients returned to full activity after an average of 5.4 months. Our case was type 3C according to the Tietjen classification, and he was able to return to sports after 5 months with conservative treatment (5). Except for minimal deformity, he had no complaints or deficits.

Wolfe et al. reported that, the adduction peak torque of the shoulder was 74% following non-surgical treatment compared to the normal shoulder (7). In a study by Hanna et al., it

was shown that there was a significant difference in the shoulder peak torque and work performance of 10 patients who underwent surgical repair and 12 patients who were treated conservatively, reaching 97% and 56%, respectively. However, in this study, the post-treatment control time is different for each patient (ranging from 1 to 108 month) (16). In the present case, at the end of a 5-month period, the maximum load with bench press training reached 160 kg compared to preinjury maximum load of 220 kg. This indicates that approximately 72% of muscle strength has been regained. However, dynamometric evaluation is missing. Bak et al. classified the treatment outcome and divided it into four categories: excellent, good, fair and poor. One of the criteria is loss of adduction strength, if it was less than 10%, they classified it as excellent, and if less than 20% it was depicted as good although they did not specified the time of full recovery (6). Since studies did not specify a cut-off value for a certain period of time, it is unlikely that the 72% gain will reflect our treatment success or failure.

CONCLUSION

According to Tietjen and Bak classification, type 3C cases are recommended to undergo surgical treatment but there is no clear information about the choice of treatment for these ruptures. Conservative treatment has recently become a trend in the literature even for the treatment of ruptures of large tendons such as the Achilles tendon. We suggest that conservative treatment should be planned primarily for other tendon and muscle ruptures, as well.

Conflict of Interest / Çıkar Çatışması

The authors declared no conflicts of interest with respect to authorship and/or publication of the article.

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Author Contributions / Yazar Katkıları

MDB conceived and conducted the research, collected and analyzed the data, and wrote the manuscript.

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