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Simultaneous rupture of the pectoralis major tendon and long head of the biceps tendon in a professional bodybuilder: A case report

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ABSTRACT

Most sports-related injuries in bodybuilders involve the upper extremities. Simultaneous rupture of the pectoralis major (PM) and long head of biceps tendon (LHBT) during bench press is extremely rare, and we report a case of such an injury. A 26-year-old male bodybuilder, with a history of previous PM tendon rupture and repair and long-term anabolic steroid use presented to our clinic with left arm and shoulder pain, bulging of the arm, and loss of axillary contour following a bench press injury that occurred two months prior. Physical examination and MRI confirmed simultaneous rupture of the PM tendon and the LHBT. Surgical management included PM reconstruction using an Achilles tendon allograft and the LHBT tenodesis performed in the same session. One possible mechanism of injury may have been altered biomechanics related to postoperative adhesions following previous PM repair. In addition, long-term anabolic steroid use may have contributed by weakening tendon integrity and increasing susceptibility to rupture.

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Introduction

Muscle injuries are a common cause of pain and functional impairment in athletes. Although most muscle injuries are partial and do not require advanced imaging, complete muscle and tendon ruptures may result in significant disability and prolonged interruption of athletic activity (1). The pectoralis major (PM) and long head of the biceps tendon (LHBT) are important structures involved in upper-extremity strength and shoulder stability. Common injury sites associated with resistance training include the rotator cuff, biceps tendon, and PM muscle. Bench press exercises particularly involve these muscles, especially when athletes maintain the high-five position (2).

Tendon ruptures may occur secondary to trauma, excessive mechanical stress, sudden eccentric contraction, or underlying tendon degeneration (3). Rupture of the LHBT is relatively uncommon in young active individuals but has been reported in strength athletes and bodybuilders (4). In addition, anabolic-androgenic steroid (AAS) use has been associated with an increased risk of tendon rupture because of its adverse effects on tendon structure and mechanical properties (4-6). Surgical repair is generally recommended in active athletes to restore function, relieve pain, and facilitate return to sports activity (5).

In this report, we present a rare case of simultaneous PM tendon and the LHBT

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rupture during bench press exercise in a professional bodybuilder with a history of previous PM repair and long-term AAS use. To the best of our knowledge, no previous reports describing simultaneous rupture of the pectoralis major tendon and long head of the biceps tendon during bench press exercise have been identified in the literature. This case therefore highlights a rare injury pattern and discusses a plausible biomechanical explanation.

Case Report

The patient was a 26-year-old professional bodybuilder and trainer with 12 years of training experience. He was right-hand dominant and highly active. He presented to our sports injuries clinic with complaints of anterior shoulder pain, loss of axillary contour and muscle bulk, and a bulging deformity in his left arm. At presentation, his weight was 90 kg and his height was 180 cm. The patient reported that two months before presentation, after approximately 40 minutes of training, he sustained an injury during the third repetition of his first bench press set. While lowering a 200-kg barbell during the eccentric phase of the movement, he suddenly experienced a tearing sensation in his chest and left shoulder accompanied by an audible pop and moderate anterior shoulder pain. He immediately noticed a bulging deformity in the anterior aspect of his arm. During contraction of the PM muscle, he also observed a depression in the superior and lateral portions of the chest wall.

The patient reported difficulty sleeping in the supine position because of pain. The following morning, he developed significant swelling and ecchymosis over the anterior arm and axillary region. He also experienced arm cramps, pain, and weakness during elbow flexion. Due to insurance-related issues, he delayed medical evaluation and continued exercising with some limitations caused by shoulder pain. The pain interfered with his sleep, training, and daily activities. Over time, the intensity of pain gradually decreased.The patient reported a history of PM tendon rupture and surgical repair two years earlier. Review of his medical records also revealed a history of anabolic steroid use. Otherwise, no significant medical history was identified.

Physical examination of the left upper extremity revealed no swelling, erythema, or ecchymosis at the time of presentation. A Popeye deformity was observed in the anterior arm. Additional findings included loss of the anterior axillary contour and retraction of the PM muscle during isometric contraction (Figure 1).

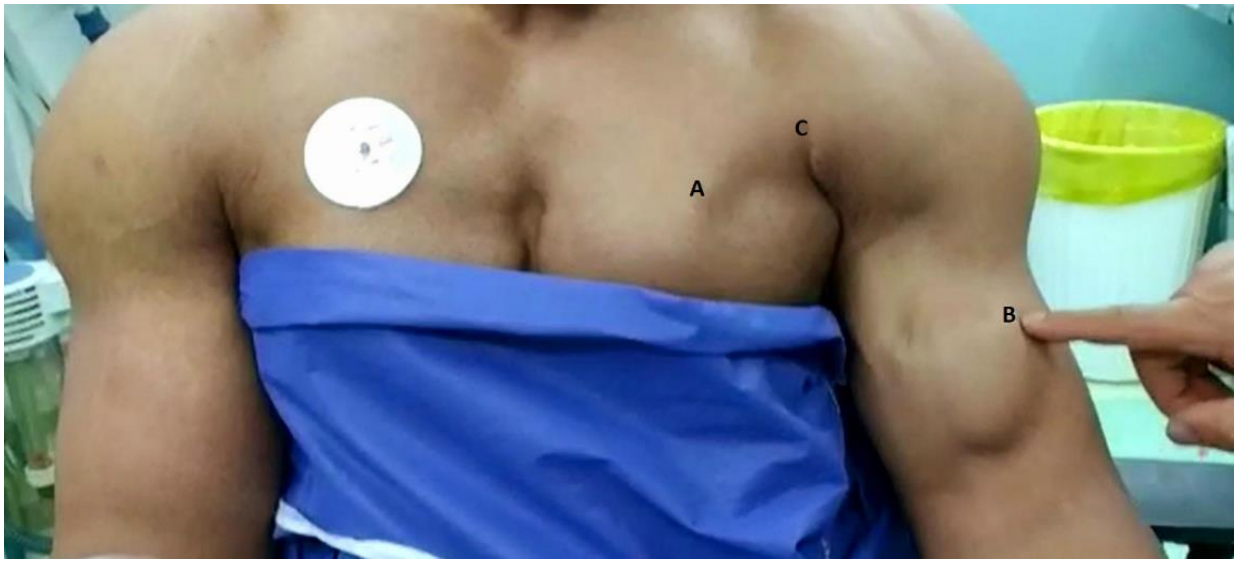

Figure 1. Clinical findings. (A) Retraction deformity of the pectoralis major muscle. (B) Prominent Popeye deformity of the left arm consistent with long head of the biceps tendon rupture. (C) Surgical scar over the anterior shoulder region.

There was mild-to-moderate tenderness and pain over the anterior aspect of the shoulder, along the bicipital groove, the proximal biceps, and the distal biceps muscle belly. Shoulder and elbow range of motion were full. No signs of impingement or acromioclavicular joint tenderness were present. The crossover tests were negative, whereas the O'Brien test was mildly positive. The patient reported discomfort during the Speed and Yergason tests. Rotator cuff strength appeared preserved on external rotation, internal rotation, and scaption testing. Hawkins, Neer, and Jobe tests were negative for rotator cuff pathology. Manual muscle testing demonstrated 5/5 strength in all shoulder movements; however, the patient reported subjective weakness and cramping during elbow flexion.

Imaging examinations
MRI confirmed rupture of the PM tendon and the LHBT on the left side without evidence of rotator cuff tear (Figure 2).

Figure 2. Magnetic resonance imaging findings. (A1, A2) MRI images showing rupture of the long head of the biceps tendon (LHBT). (B1, B2) MRI images showing rupture of the pectoralis major tendon.

Treatment

Several treatment options were discussed with the patient considering the chronic nature of the injury and the resulting functional limitations. Because the patient continued to work as a bodybuilding trainer and considered cosmetic appearance and strength recovery important priorities, and given his desire to return to professional sports activities, surgical treatment was selected after orthopedic evaluation. PM reconstruction was performed using an Achilles tendon allograft combined with subpectoral biceps tenodesis.

Following surgery, the arm was immobilized in a shoulder immobilizer for six weeks. Gradual restoration of shoulder and elbow range of motion was then initiated, followed by strengthening and rehabilitation exercises.

At 6-month telephone follow-up, the patient reported return to bodybuilding activities and coaching without major functional limitations, although no formal clinical examination or functional assessment was performed.

Surgical method

Under general anesthesia in the beach chair position, a 7 to 10 cm deltopectoral incision was made to access the pectoralis major tendon. The healthy clavicular portion was preserved while the retracted sternal head was dissected. An Achilles allograft extended the retracted tendon and was secured to the lateral edge of the bicipital groove using two anchor sutures. A small lateral arm incision enabled graft-bone contact after preparing the insertion site. The arm was kept in neutral position to maintain proper muscle tension and prevent external rotation limitation. A Hemovac drain was placed, and soft tissues were repaired in layers. For the long head of biceps tendon rupture, intra-articular tenotomy was followed by subpectoral tenodesis with an absorbable interference screw via a small incision.

Discussion

Most sports-related injuries in bodybuilders involve the upper extremities, particularly during resistance training exercises such as the bench press (7). The present case describes a simultaneous rupture of the PM tendon and the LHBT during bench press exercise, which appears to be extremely rare. To the best of our knowledge, no previous reports of simultaneous PM tendon and the LHBT rupture during bench press exercise have been identified in the literature. Tendon ruptures in strength athletes are typically associated with excessive mechanical loading, sudden eccentric contraction, and increased tensile stress across the musculotendinous unit(4, 5) .

Previous studies have reported PM ruptures in athletes attempting to lift extremely heavy loads during bench press exercises, particularly weights exceeding 200 kg (6). During the eccentric phase of the bench press, the shoulder is positioned in extension, abduction, and external rotation, placing substantial tension on the PM tendon. Additional contributing factors such as inadequate warm-up, muscle fatigue, poor movement coordination, and sudden overload may further increase the risk of tendon failure(8) .

Reports of the LHBT rupture during bench press exercise are extremely limited. During the bench press movement, the PM, anterior deltoid, and triceps brachii function as the primary movers, whereas the biceps brachii mainly acts as a stabilizing muscle (9) . Although previous studies have demonstrated biceps activation and hypertrophy during bench press exercises (10) , the mechanical load applied to the LHBT alone is generally considered insufficient to cause tendon rupture in healthy young athletes. Therefore, factors beyond mechanical loading alone may have contributed to tendon failure in the present case. One possible explanation for this rare injury pattern is altered biomechanics following previous PM repair. Postoperative scar formation or adhesions may have changed normal force transmission across the anterior shoulder, potentially creating abnormal stress distribution during high-load eccentric contraction. Following failure of the PM tendon, excessive tensile forces may have been transferred to the LHBT, contributing to its rupture. However, this mechanism remains hypothetical, as no direct intraoperative or imaging evidence of adhesions was available.

Postoperative adhesions are common complications following soft tissue surgery and may impair normal tendon gliding and force transmission (11, 12). Factors associated with adhesion formation after tendon repair include tissue trauma, prolonged immobilization, and postoperative scar formation (13). Early controlled rehabilitation and mobilization protocols are generally recommended to reduce the risk of postoperative stiffness and adhesions following tendon repair procedures (14).

Another important contributing factor in this case may have been the patient's long-term anabolic-androgenic steroid (AAS) use. Previous studies have demonstrated a significant association between AAS use and upper extremity tendon ruptures in strength athletes. Proposed mechanisms include disproportionate muscle hypertrophy relative to tendon adaptation, impaired collagen organization, and reduced tendon elasticity, all of which may increase susceptibility to tendon injury under

excessive mechanical loading. Therefore, clinicians should consider AAS use as a potential risk factor when evaluating tendon ruptures in highly muscular athletes (15). This case should be considered a hypothesis-generating report rather than evidence of a definitive causal relationship.

Conclusion

Simultaneous rupture of the pectoralis major tendon and long head of the biceps tendon is an extremely rare sports injury. This case highlights a unique injury pattern and proposes a possible biomechanical mechanism potentially related to previous surgery and altered force transmission. Long-term anabolic-androgenic steroid use may also represent a contributing risk factor. Clinicians should be aware of this injury pattern in athletes with a history of previous PM repair and anabolic steroid use. Appropriate rehabilitation after tendon repair and caution during high-load resistance training may help reduce the risk of subsequent injury. Further studies are required to better understand the biomechanics of this rare injury pattern.

Authors' contributions

All authors made a substantial contribution to the conception of the work, drafting and revising the work, final approval of the version to be published and agree to be accountable for all aspects of the work.

Ethics approval and consent to participate

The authors declare that this case report was conducted in accordance with the highest ethical standards for research and publication.

Consent for publication

Written informed consent was obtained from the patient for the publication of all relevant clinical data and accompanying images included in this manuscript.

Competing interests

All named authors hereby declare that they have no conflicts of interest to disclose

Availability of data and materials

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