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Recovery from Isolated Biceps Tendinitis Through Physiotherapy and Therapeutic Massage in Youth Team Sports Involving Ball Throwing

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Abstract

The aim of this research was to establish an effective rehabilitation program for youth athletes involved in team sports requiring ball-throwing motions, such as handball and polo, who experience biceps tendinitis in their throwing arm. This program sought to expedite their physical recovery.
Data was collected over two competitive seasons and organized systematically. The study involved eight male handball players and twelve female polo players, all aged between 12 and 14, from private clubs associated with the physiotherapy center where treatment took place.
A three-phase therapy regimen was designed. The Yergason and Speed tests were employed to identify biceps tendinitis, while the SPADI scale measured shoulder pain and functional limitations.
The initial phase involved three days of therapeutic massage targeting the shoulder to enhance circulation and alleviate pain associated with movement. Results from palpation confirmed positive outcomes. The second phase incorporated both massage and three days of passive mobilization exercises for shoulder muscles, which helped reduce inflammation and improved joint mobility. The third and final phase, spanning four days, combined the second phase's treatments with ten muscle-strengthening exercises aimed at restoring upper limb strength. This allowed participants to resume group training, with pain reduced to such a minimal level that it no longer interfered with physical activities.

Key words: biceps, tendonitis, physical effort, handball, polo.

Introduction

Biceps tendinitis is a condition involving inflammation of the tendon around the long head of the biceps muscle. When this inflammation is localized within the bicipital (intertubercular) groove, it is termed primary biceps tendinitis, affecting approximately 5% of individuals with biceps-related issues (Patton & McCluskey, 2001).

The condition itself, biceps tendinitis, refers to swelling of the tendon that envelops the long head of the biceps. In some cases, tendon degeneration, often resulting from repetitive overhead activities or natural aging, leads to a condition known as biceps tendinosis (Churgay, 2009; Stefanica et al., 2024).

Typical progressive degeneration of the biceps tendon can include stages like tenosynovitis, tendinosis, delamination, pre-rupture, and eventual rupture. Currently, tendinosis is a significant area of research focus, as it has become more comprehensively understood, and various treatment methods are being investigated (Rees et al., 2006; Groza & Grosu, 2015).

Most cases of biceps tendinitis are managed through conservative methods. However, regular monitoring and discussions regarding the potential risk of rotator cuff degeneration are advised (Warren, 1985).

Biceps tendon issues are most frequently seen in athletes aged 18 to 35 who participate in sports that involve throwing, physical contact, swimming, gymnastics, or martial arts. These athletes commonly experience secondary impingement, which may be due to instability of the scapula, laxity of the anterior shoulder capsule, or tightness in the posterior capsule. Other factors, like labral or rotator cuff tears, may expose the biceps tendon to the coracoacromial arch, leading to impingement(Abrams, 1991; Stefanica et al., 2024; Ioan M.R., 2021).

In the majority of healthy individuals, the long head of the biceps tendon (LHBT) has limited impact on shoulder stability during movement. The primary role of the biceps muscle is to enable forearm supination and elbow flexion, while its role in shoulder abduction contributes minimally to the force required (Nho et al., 2010; Gogean, 2013).

The shoulder joint, comprising the humeral head, scapula, and clavicle, is known for its exceptional range of motion due to its complex structure. Stability is maintained through an interplay of ligaments and muscles. The biceps muscle, with its long and short tendinous heads, contributes to this balance. The LHBT originates from the supraglenoid tubercle and upper glenoid labrum, while its path continues through the bicipital groove and down the forearm (Frank et al., 2018).

A study by Jobe and Perry on athletes found that the biceps muscle exhibits peak activation during elbow flexion and forearm deceleration in throwing motions. However, there is minimal activity in the proximal biceps during the early stages of the throw (Jobe et al., 1984).

The long head of the biceps tendon originates from the supraglenoid tubercle and superior labrum and exits the shoulder joint through the bicipital groove, positioned between the greater and lesser tuberosities of the humeral head. The rotator interval, a triangular region bordered by the subscapularis and supraspinatus tendons, helps secure the biceps tendon, and injuries here are often associated with rotator cuff issues (Curtis & Snyder, 1993; Harwood & Smith, 2004).

Biceps tendinitis frequently manifests as sharp, localized pain in the shoulder. This discomfort

typically radiates from the bicipital groove towards the deltoid or down the arm in a radial pattern, making it challenging to differentiate from rotator cuff or cervical spine issues (Ahren & Boileau, 2007). Pain usually worsens at night, especially if the affected shoulder is compressed. Repeated overhead movements, pulling, or lifting can also exacerbate symptoms, and athletes may experience intensified discomfort during the follow-through phase of a throw (Abrams, 1991; Harwood & Smith, 2004).

One common result of chronic biceps tendinitis is tendon rupture, often accompanied by an audible pop and immediate pain relief. Bruising and swelling in the shoulder, along with a bulge near the elbow due to muscle retraction, are typical signs. Risk factors for rupture include rotator cuff injuries, recurrent tendinitis, previous tendon tears, and conditions like rheumatoid arthritis (Ahrens & Boileau, 2007). In cases where there are signs of catching, locking, or popping, a SLAP (Superior Labrum Anterior and Posterior) tear might be present, often due to trauma or repetitive overhead activity (Parentis et al., 2002; Gogean G., 2014, Ioan. M.R., 2022).

The primary symptom of biceps tendon injuries is localized tenderness at the bicipital groove. During physical exams, this area is often assessed by rotating the arm, which brings the affected groove to the fore, helping clinicians pinpoint the injury (Patton & McCluskey, 2001).

Materials and methods

The study was conducted with twenty athletes, aged 12 to 14, who played handball and polo. These participants, which included eight male handball players and twelve female polo players, were members of sports clubs collaborating with a medical rehabilitation center.

Athletes reported pain in the shoulder and the arm used for throwing, which worsened with overhead arm movements. Many described a sensation of heaviness in the shoulder and arm. Notably, none of the athletes experienced a complete tear of the long head of the biceps tendon, a condition where symptoms significantly improve due to the disappearance of inflammation but result in a “Popeye” sign, where a visible bulge forms on the front of the upper arm due to muscle retraction.

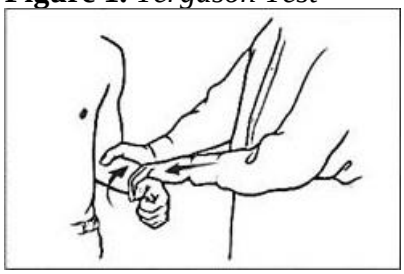
Initially, athletes completed the Shoulder Pain and Disability Index (SPADI) survey, which includes 13 questions assessing pain and functional limitations related to activities requiring upper limb use. The pain component consists of 5 questions, while the disability component has 8 questions. Each participant rated their pain and difficulty level with tasks involving the affected shoulder. Scores for the pain section can reach up to 50, while the disability section totals up to 80. The combined SPADI score is then converted into a percentage (Breckenridge & McAuley, 2011).

For diagnosis, we utilized the Yergason and Speed tests, both of which helped to identify pain and inflammation associated with biceps tendinitis.

The Yergason Test specifically targets potential biceps tendon issues, such as tendinitis and SLAP (Superior Labrum Anterior Posterior) lesions. During this test, the athlete stands or sits with the upper arm in a neutral position and the elbow bent at 90 degrees while the forearm is pronated. They are asked to rotate their arm outward and supinate against the resistance provided by the

therapist's grip on the lower forearm, near the wrist. If the athlete feels pain at the bicipital groove, this is a positive indication of a possible biceps tendon or SLAP lesion. Additionally, if the athlete reports a "clicking" sensation, further investigation into potential injuries of the transverse humeral ligament, which stabilizes the tendon in the bicipital groove, may be necessary (Hattam & Smeatham, 2020). (See Figure 1)

Figure 1. *Yergason Test*



The Speed's Test is commonly used to identify issues like superior labral tears and biceps tendinitis. To perform the test, the examiner positions the patient's arm in shoulder flexion with the palm facing upward, ensuring that the elbow is fully extended and the arm is externally rotated. The patient is then asked to resist as the examiner applies downward pressure on the arm. If the patient experiences pain in the bicipital groove during this movement, it indicates a potential biceps tendon or labral issue (Dutton et al. 2004). (See Figure 2)

Figure 2. *Speed Test*

The tests are deemed positive if they reproduce pain in the biceps tendon or along the bicipital groove.

The treatment regimen for the athletes involved three structured phases:

1. **Three Days of Massage Therapy**
2. **Three Days of Massage Therapy Combined with Passive Mobilization Exercises**

for the Shoulder Muscles

3. **Four Days of Massage Therapy Combined with Muscle Strengthening Exercises to Enhance Shoulder Functionality**

Phase 1 (3 days)

Massage therapy (MT) was utilized to help alleviate pain. Although often associated with complementary and integrative medicine, MT is now frequently incorporated into allied health fields such as physical and occupational therapy. The demand for complementary therapies, particularly massage, has been steadily rising as more individuals explore alternative treatment options (Crawford et al., 2016, Muntean et al., 2023).

Massage therapy, one of the oldest methods for pain relief, employs a series of targeted and general techniques such as effleurage, petrissage, and tapping movements. These can be performed manually or with mechanical devices (Imanura et al., 2012). However, research on the effectiveness of MT for conditions like neck pain has yielded mixed results. While some studies suggest limited evidence of benefit (Haraldsson et al., 2006), others report that massage can provide immediate relief for neck discomfort (Brosseau et al., 2012).

Therapeutic shoulder massage was employed to warm up the shoulder area and boost blood circulation. The massage targeted several specific muscle groups:

- **Deltoid**: This muscle shapes the outer contour of the shoulder and plays a key role in shoulder movement.
- **Supraspinatus**: A deep muscle crucial for initiating shoulder elevation.
- **Infraspinatus**: A deep muscle that facilitates external rotation of the shoulder.
- **Subscapularis**: Responsible for internal rotation of the shoulder.
- **Biceps**: Located at the front of the upper arm, contributing to shoulder stability and movement.
- **Teres Major and Minor**: These muscles aid in the shoulder's external rotation.
- **Triceps**: Positioned at the back of the upper arm, involved in shoulder extension and stabilization.
- **Trapezius**: Supports the shoulder and neck, contributing to shoulder elevation and movement.
- **Rhomboid**: Helps stabilize the shoulder blade in relation to the spine.

Each day, the therapist performed a 15 to 20-minute massage on these muscle groups, and athletes noted a decrease in pain over the following days.

Phase 2 (3 days)

In this phase, therapeutic massage from the first phase continued, while passive shoulder mobilization exercises were introduced to further enhance shoulder flexibility and reduce discomfort.

Exercise 1 - Pendulum Swings

The patient leans forward, supporting themselves with one hand on a table, while allowing the

affected arm to hang freely. Without moving the torso, the arm is swung gently forward and backward, then side-to-side, and finally in small circular motions. The movement is performed as relaxed as possible from the shoulder joint, with each direction consisting of 2-3 sets of 10 repetitions. This exercise aids in gentle mobilization of the shoulder muscles without active effort.

Exercise 2 - Shoulder Stretch Across the Chest

The athlete brings the injured arm across the chest as far as comfortably possible while keeping the shoulders relaxed. The position is maintained for 30 seconds, followed by a 20-second rest. This stretch is repeated for two sets of five repetitions and is effective for stretching the muscles involved in shoulder rotation.

Exercise 3 - Assisted Internal Rotation

In this exercise, the athlete holds a stick behind the back with both hands. With a straight posture, the stick is moved horizontally to encourage internal rotation of the shoulder. This position is held for 30 seconds with a 20-second break in between, and repeated for two sets of five repetitions. This exercise focuses on gently stretching the internal rotator muscles, particularly those related to the subscapularis.

Exercise 4 - Assisted External Rotation

The patient keeps elbows close to the body, holding a pole with both hands. Maintaining a straight posture, they apply a horizontal movement to the pole, inducing external rotation at the target shoulder. This movement is also performed in two sets of five repetitions and places stress on the external rotator muscles, enhancing flexibility and range of motion.

Exercise 5 - Side-Lying Shoulder Stretch

While lying on the side with the affected shoulder underneath, the patient bends the elbow at a 90-degree angle. The top arm gently lowers the forearm of the affected arm to create a stretch in the shoulder's rotator muscles. This position is held for 30 seconds, followed by a 20-second relaxation, and repeated for two sets of five repetitions. This exercise helps maintain flexibility and stretches the rotator cuff muscles.

Phase 3 (4 days)

The previous stage's massage and mobilization exercises continued, serving as a warm-up for this final phase, which focused on strengthening the shoulder and upper arm through a set of specific exercises.

Exercise 1 - Trapezius Toning

Standing with the elbow bent, the athlete holds one end of an elastic band. While maintaining shoulder blade retraction, they pull the elbow backward, then slowly return to the starting position. This exercise consists of three sets of 10 repetitions.

Exercise 2 - External Rotation at 90 Degrees of Abduction

Designed to strengthen the infraspinatus and teres minor muscles, this exercise involves holding an elastic band with the arm raised horizontally and the elbow bent at 90 degrees. The athlete raises the band to head level, then returns slowly. Three sets of 10 repetitions are completed.

Exercise 3 - Internal Rotation

With the elbow bent at 90 degrees and close to the torso, the athlete pulls an elastic band inward while maintaining elbow position. This movement, performed in three sets of 10 repetitions, targets the shoulder's internal rotator muscles.

Exercise 4 - External Rotation

Also performed with the elbow bent at 90 degrees and close to the body, the athlete pulls the elastic band outward, strengthening the external rotators with three sets of 10 repetitions.

Exercise 5 - Bicep Curl

The athlete stands upright, holding a 0.5 kg dumbbell in each hand, and curls the weights up to shoulder level. This movement is sustained for a moment before slowly lowering. Three sets of 10 repetitions focus on toning the biceps.

Exercise 6 - Tricep Extension

Standing with a 0.5 kg dumbbell, the athlete holds the weight with an elbow bent behind the head. With the core engaged, they extend the arm to lift the dumbbell overhead, then lower it slowly. Three sets of 10 repetitions target the triceps.

Exercise 7 - Trapezius Strengthening

Seated with one leg bent and an arm supported on a bench, the athlete lifts a 0.5 kg weight to shoulder height, holding briefly before lowering. This exercise, with three sets of 10-15 repetitions, strengthens the trapezius muscle.

Exercise 8 - Scapular Stabilization

Lying prone with arms at the sides, the athlete pulls the shoulder blades together and holds for 10 seconds before relaxing. Three sets of 10 repetitions enhance scapular stability.

Exercise 9 - Seated Shoulder Abduction

Seated on a bench, the athlete raises a 0.5 kg dumbbell from the side to head level and returns slowly. Three sets of 10-15 repetitions focus on the shoulder's external rotators.

Exercise 10 - Rotator Cuff Strengthening with Weights

Lying on their back with an arm abducted to 90 degrees, the athlete alternates between internal and external rotation using a 0.5 kg weight, keeping the elbow in contact with the surface. Three sets of 10 repetitions strengthen the shoulder's internal and external rotators.

Following the exercises, ice was applied to the shoulder and muscle groups for 10-15 minutes to reduce swelling and offer pain relief by increasing blood circulation to the area.

Results

After the initial phase of treatment, the athletes no longer experienced significant pain during palpation, nor did they report discomfort during the Yergason and Speed tests.

The second phase, which focused on passive mobilization exercises, proved effective in improving joint mobility and reducing pain during movement. In the final phase, muscle toning exercises helped enhance the strength and flexibility of shoulder-supporting muscles, enabling the athletes to regain full upper limb mobility and strength.

The initial SPADI (Shoulder Pain and Disability Index) score across all participants averaged 68.3. Following treatment, the average dropped to 2.35, representing a 96.56% improvement. When

analyzed by gender, the average SPADI score for boys decreased from 73.87 initially to 2.25 post-treatment, reflecting a reduction of 96.95%. For girls, the initial average was 64.58, which fell to 2.41 after treatment—a 96.27% decrease.
The SPADI assessment also allowed for an analysis of pain and shoulder dysfunction individually. On average, initial pain scores were 33.85, while post-treatment scores averaged 1.9. The initial shoulder dysfunction score averaged 34.45, dropping to 0.45 after treatment.
After ten days of treatment, divided into three phases, all athletes were able to return to their regular training routines without shoulder or arm pain. The results were consistent across genders, showing a substantial improvement in both boys and girls.

Discussions

Interpretation of Results

The results of this study demonstrate a significant improvement in mobility and pain reduction among young athletes, confirming the effectiveness of a structured therapy program combining therapeutic massage and physical exercises. The average reduction in the SPADI score by over 96% is remarkable, suggesting that conservative treatment approaches effectively alleviate the symptoms of bicipital tendinitis without requiring invasive interventions.

Importance of Conservative Therapy and Its Impact on Mobility

This study highlights that conservative therapy, through massage and controlled exercises, can effectively reduce inflammation and the symptoms associated with bicipital tendinitis, especially in the early stages of the condition. Moreover, passive mobilization and muscle-strengthening exercises not only contributed to pain relief but also ensured better shoulder functionality, allowing athletes to resume their activities without discomfort.

Prophylaxis of Bicipital Tendinitis

Athletes involved in repetitive overhead motions, such as throwing, are at high risk for developing this condition. This study underscores the importance of preventive programs, which should include exercises to balance the shoulder muscles and strengthen the rotator cuff and periscapular muscles. Stretching exercises for the anterior shoulder muscles, like the pectoralis minor, may also play a role in reducing the risk of developing bicipital tendinitis.

Study Limitations and Suggestions for Future Research

Although this study yielded promising results, some limitations should be considered. The small sample, comprised only of athletes aged 12 to 14, may limit the generalizability of the results. Future studies could include a more age-diverse sample and explore the effects of different treatment durations for tendinitis. Moreover, long-term monitoring could reveal the sustainability of conservative therapy's effects on shoulder functionality.

Contribution to Clinical Practice

This study may contribute to improving clinical protocols for conservative treatment of bicipital tendinitis, providing additional evidence on the benefits of a customized, three-phase approach. Incorporating therapeutic massage alongside strengthening and mobilization exercises showed positive outcomes, suggesting that such protocols could be widely adopted in physical therapy and rehabilitation clinics.

The human body operates with remarkable efficiency, coordinating various segments to maintain balance and function in all situations (Diaconu et al., 2021).

Conclusion

This study demonstrated that a combined therapeutic approach involving targeted massage and structured physical exercises significantly improves symptoms of bicipital tendinitis in young athletes. The three-phase treatment program not only reduced pain levels but also restored shoulder mobility and strength, allowing participants to resume their sporting activities without limitations. The high success rate, with a reduction in the SPADI score exceeding 96%, highlights the potential of conservative therapy as a first-line intervention in cases of mild to moderate bicipital tendinitis.

Early Intervention Matters: Early diagnosis and timely intervention with a structured therapeutic regimen are crucial to prevent the progression of tendinitis to more severe forms that may require surgical intervention.

Holistic Approach: The success of combining massage with passive mobilization and strengthening exercises underscores the value of a holistic approach in musculoskeletal rehabilitation. This method addresses not only pain but also functionality and muscular balance, critical for athletes involved in overhead sports.

Customized, Phase-Based Protocols: The three-phase treatment plan, beginning with pain management, followed by flexibility improvement, and concluding with strength conditioning, offers a model that could be adapted for similar conditions. This personalized, step-by-step progression may enhance both patient compliance and overall treatment outcomes.

The findings suggest that therapeutic massage and physical exercises should be considered as primary strategies for managing bicipital tendinitis in athletic populations. Integrating such conservative measures into standard clinical practice could reduce the need for invasive treatments and contribute to faster, safer recovery in sports-related injuries.

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