Rotator Cuff Tears in Athletes: Part II. Conservative Management – American Mind

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6.1 Introduction

Rotator cuff tears are common injuries in athletes and may occur as a result of acute trauma (such as a fall onto an outstretched arm) or, more commonly, as a result of chronic overuse with repetitive overhead activity. While traumatic conditions are generally treated surgically, chronic overuse injuries are more often treated using a conservative approach.

Overuse injuries of the shoulder are commonly related to microtrauma due to repetitive overhead activities, especially in throwing sports such as baseball or javelin. As these athletes progress to higher levels of competition, greater demands are placed on the glenohumeral joint with increased throwing velocities. Throwing velocity is maximized by increases in shoulder abduction and external rotation range of motion, which leads to anatomic bony and soft tissue adaptations that facilitate hyperabduction and external rotation over time. These anatomic changes can lead to contracture of the posterior capsule with subsequent posterosuperior humeral head migration [1]. This is known as glenohumeral internal rotation deficit (GIRD), which in addition to restricted internal rotation can lead to tearing of the superior labrum (SLAP) via the "peel-back" mechanism [1]. GIRD may also lead to posterosuperior glenoid impingement – an entity characterized by posterosuperior rotator cuff and/or labral tearing as a result of osseous impingement between the greater tuberosity and the glenoid rim in positions of abduction and external rotation (internal impingement). Additionally, muscle imbalances can produce scapular dyskinesis, which may decrease the space available for the rotator cuff tendons to pass beneath the acromion, thus leading to fraying and partial-thickness tearing. The majority of throwing athletes have articular-sided, partial-thickness rotator cuff tears, most of which occur near the interval between the supraspinatus and infraspinatus tendons, presumably due to internal impingement [1].

Athletes who undergo surgery in the midst of a season are commonly excluded from play for the majority of the season. Even off-season

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surgical treatment may limit return to play or a return to the preinjury level. For efficient and successful treatment with physical therapy, it is important to keep in mind some basic considerations and to follow the basic principles of rehabilitation described below.

Although the pathomechanisms surrounding rotator cuff tears in overhead athletes are still heavily debated, conservative management remains a mainstay of treatment [2]. Therefore, the purpose of this chapter is to review the basic principles of conservative management for rotator cuff tears in athletes with a focus on the overhead athlete.

6.2 Basic Considerations

In the overhead athlete with a rotator cuff tear, the primary goal of nonsurgical management is to achieve a return to full competitive sport while also preventing further injury. This is underscored by specific rehabilitation goals such as decreasing pain and inflammation, strengthening surrounding musculature to promote proper joint kinematics, and promoting proper throwing mechanics that maintain a normal scapulohumeral angle. It is unlikely that conservative treatment induces healing of a torn rotator cuff. However, when overhead athletes present with pain as their major symptom, they can often be treated nonoperative with the goal to improve their range of motion and return them to prior competitive levels.

6.3 Basic Principles: Phases of Rehabilitation

6.3.1 Phase 1

In the overhead athlete with a rotator cuff tear not qualifying for initial surgery, phase 1 of rehabilitation should focus primarily on methods to decrease pain and inflammation, which facilitates range of motion while decreasing pain arthrogenic inhibition, so that more advanced exercises may be implemented. In addition to rest, activity modification, cryotherapy, and anti-inflammatory medications, there are several other therapeutic options that may help to decrease pain and inflammation associated with rotator cuff tears. These may include transcutaneous electrical nerve stimulation (TENS), massage therapy, and laser and heat therapy. However, there is a paucity of evidence to support their use specific to shoulder injuries in the overhead athlete. Nevertheless, since these modalities are typically inexpensive and present minimal risk to the patient, subjective and objective improvements as a result of these interventions may warrant their use.

Subacromial and/or intra-articular injections can also be used to decrease pain and inflammation in patients with rotator cuff tears. Injections may include hyaluronic acid [3], corticosteroids [4, 5], platelet-rich plasma [6], or local anesthetic preparations [7]. While local anesthetics and corticosteroids have been shown to be effective at decreasing pain and inflammation in those with rotator cuff tears, the efficacies of hyaluronic acid and platelet-rich plasma injections are still debated.

In addition to decreasing pain and inflammation, it is critical to ensure that throwing athletes maintain appropriate glenohumeral range of motion. Although the throwing shoulder is often found to have increased external rotation and decreased internal rotation, the total arc of motion should be almost equal to that of the non-throwing shoulder [8]. When physical examination reveals a loss of internal rotation with an associated decrease in the total arc of motion (i.e., glenohumeral internal rotation deficit [GIRD]), specific stretching exercises should be implemented to relieve contractures of the posterior structures, pectoralis minor, and short head of the biceps tendon [8, 9]. Cross-body stretching, the sleeper stretch, and the unilateral corner stretch have been found to significantly increase internal rotation capacity in overhead athletes with GIRD [9, 10]. If an athlete returns to throwing activities before achieving their normal arc of motion, symptoms may recur even after completion of a full rehabilitation program [11]. Therefore, active and passive glenohumeral range of motion should be maintained and emphasized throughout all phases of the rehabilitation process to ensure a successful return to throwing sports.

6.3.2 Phase 2

The athlete may progress to the second phase of rehabilitation following the relief of pain and inflammation. In phase 2, strengthening of surrounding musculature (including that of the hand, wrist, and elbow) is initiated while maintaining pain-free active and passive range of motion. Although the specific strengthening program should be individualized according to the needs of each patient, some have shown that specific emphasis on scapular retractors and glenohumeral external rotators may be beneficial during rehabilitation of the overhead athlete [12].

The concepts of neuromuscular control and dynamic stability center around the coordination of agonist/antagonist muscle groups which work together to produce force couples that center the humeral head within the glenoid fossa at all levels of humeral elevation and rotation. Techniques that focus on neuromuscular control, such as plyometrics, perturbation training, proprioceptive neuromuscular facilitation (PNF) exercises, and closed kinetic chain exercises, should be implemented into the rehabilitation program of any overhead athlete to prevent future injury [13].

6.3.3 Phase 3

Progression to phase 3 requires that the athlete demonstrates optimal upper extremity strength, normalization of range of motion deficits, advanced neuromuscular control, a lack of symptoms, and a lack of significant physical examination findings. In phase 3, intensive upper and lower extremity strength and endurance training is initiated along with an introduction to plyometric exercises that are designed to optimize neuromuscular control. Furthermore, core stability has to be strengthened to ensure proper throwing motion to generate efficient forces within the shoulder joint motion, counteracting distractive and compressive work in a synchronous and coordinated fashion. Any mismatch occurring in this kinematic chain may lead to pathological shear stress in the shoulder joint and to injuries [11]. Therefore, to successfully treat any rotator cuff tear with physical therapy, potentially underlying deficits in the athlete's throwing mechanics have to be detected and incorporated. The athlete should be taught to work on a balanced distribution of training exercise for the agonist and antagonist muscles of the upper and lower extremities and the trunk to optimize core stability [14, 15]. To prepare for phase 4, light endurance-like roadwork and cycling as well as throwing activities should be started at this point to help transition the athlete back into overhead activity.

6.3.4 Phase 4

During phase 4, the athlete is gradually returned to sport. A structured interval throwing program should be implemented to ensure a graduate progress because there is an elevated risk of rotator cuff re-injury within this stage [11]. Criteria for return to play should be adequate strength tested with handheld dynamometry [16, 17]; achievement of sufficient thresholds in functional outcome scores, such as the Kerlan-Jobe Orthopaedic Clinic (KJOC) questionnaire [18]; controlled pain; and appropriate ROM and scapulohumeral rhythm before an athlete may be considered "cleared" for full activities. Furthermore, increases in pain during overhead activity should be addressed with rest and activity modification. When indicated, pain-free stretching should be continued after rehabilitation to prevent loss of internal rotation and recurrent symptoms [8]. However, the strength training program should be altered gradually to avoid an overuse injury [19].

6.4 Conservative Treatment's Elements

6.4.1 Passive and Active Range of Motion Exercises

Stretching and strengthening exercises should be conducted under supervision of a professional physical therapist. A specific rehabilitation program should be tailored to the individual athlete

as well as the specific type of tear to eliminate pain, to maintain and maximize range of motion, and to prevent adhesions due to healing processes [20]. Shoulder-specific exercises should involve the rotator cuff muscles, periscapular stabilizers, and the deltoid muscle. Furthermore, depending on the result of the evaluation of throwing mechanics, specific exercises for the lower body as well as for the trunk should be included (body core stability).

Exercises for the rotator cuff and the deltoid include range of motion exercises, proprioceptive exercises, and strengthening exercises (Chap. 33, Sect. 3.1.1).

6.4.2 Selective Stretching

To prevent anterior and posterior capsular tightness, certain stretching exercises are advisable. Posterior shoulder tightness is frequently seen in combination with rotator cuff tears in overhead athletes and is one of the most common causes for shoulder pain [21]. Posterior shoulder tightness can be treated by special exercises. These include internal/external rotation stretch and the "sleeper stretch" (Chap. 33, Sect. 3.1.1).

6.4.3 Core Stability

Underlying scapular dyskinesis should be addressed (see Sect. 6.4.1) to integrate scapulothoracic muscles into any sport-specific motion [22]. Exercises for the trunk and the lower extremity in order to improve and maintain "core stability" are important. This can also be achieved by strengthening and proprioceptive exercises described in Chap. 33.

In addition, exercises for special throwing movements of the athlete should be taught, if applicable (Chap. 33).

6.4.4 Injections

Subacromial and intra-articular injections may be used to decrease inflammation and rapidly assist in the rehabilitation and recovery process [20]. Under sterile conditions, steroids, local anesthetics, or hyaluronic acid can be injected into the glenohumeral joint or the subacromial space, depending on the location of the tear. Usually, a corticosteroid is used in combination with a local anesthetic. Corticosteroids can decrease the inflammation; however, collagen necrosis limits their usage. Even in a young athlete's shoulder, corticosteroids should not be injected more than once every 3 months and, in our opinion, not more than three times in total. Injection of hyaluronic acid may be beneficial in some cases. As a component of the natural synovial fluid, it may help to preserve joint friction at a physiological level [23].

However, for injection of any substances in athletes, particular caution has to be obtained to meet the anti-doping regulations. For most of the national anti-doping agencies, intra-articular injections of steroids and other substances are allowed for many specific reasonable indications. Nevertheless, every indication and every forbidden substance have to be justified and notified to the National Anti-Doping Agency prior to treatment.

6.4.5 Medications

As with systemic medications, common NSAIDs should be used [24]. To obviate gastrointestinal reactions and side effects of NSAIDs, a proton pump inhibitor should be administered in addition. Due to an increased risk of increase of vascular events and myocardial infarction, we do not recommend the use of COX2-inhibitors. In cases of allergic reactions to NSAIDs, paracetamol is an adequate alternative.

6.4.6 Cryotherapy

Cryotherapy is effective for initial short-term pain relief. It may diminish the release of blood and proteins from the surrounding vasculature by reducing tissue metabolism. Ice may be effective for reducing swelling and pain in cases of acute inflammatory tendinopathies by blunting the

inflammatory response [25]. Applications of ice through a wet towel for 10-minute periods seem to be most effective [25].

6.4.7 Duration and Frequency of the Physical Therapy

Conservative treatment is targeted to progressively bring athletes back to their preinjury level and to elite competition as quick as possible.

In our experience, conservative treatment that outlined is a reasonable option for the individual athlete, with duration to not exceed 12 weeks without documented improvement. Furthermore, the athlete should have entered phase 4 of the rehabilitation and conceivably be ready to return to their prior level of competitive sports after 6 months. If these thresholds cannot be met, the athlete will most likely not improve from further conservative treatment and may benefit surgery.

6.5 Conclusion

6.5.1 Principles of Injury Prevention

For injury prevention, athletic cross-training in different recreational activities (as opposed to only working on the throwing motion) exposes the body to various movements and forces with the goal to maximize overall physical and mental well-being of the athlete [11]. Some important principles should be followed to maintain throwing motion capability and to prevent acute injuries in the overhead athlete. The act of throwing in the dominant arm may lead to a reduction of internal rotation, resulting in a higher risk of injury [26]. To decrease this risk, it is necessary to maintain the full range of motion throughout the year. This may be achieved by a specific stretching program. Furthermore, to maintain the proper throwing mechanics, core stability should be emphasized as described (phase 3). Both glenohumeral and scapulothoracic articulation need to be controlled by the athlete neuromuscularly for proper kinematic movements at the elite level (also see Sect. 6.3.2) [13]. Within the off-season, training programs should include rest and exercises specific to the sport in question and position played. A program may include strength, power, range of motion, and/or endurance exercises.

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