Use of Active Release Techniques in the Postoperative Shoulder: A Case Report

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abstract: *Much information has been published regarding rehabilitation of the postoperative shoulder in both the athletic and general populations. Little, however, addresses the importance of manual soft tissue techniques as part of the postoperative management, the major focus of which is active strength and flexibility exercises. This article reports on the practical application and benefits of adding Active Release Techniques Soft Tissue Management System to the rehabilitation of the postoperative shoulder. The case presented is that of a male athlete who had an anterior dislocation of the glenohumeral joint during a motorcycle accident. Two years after undergoing a Bankart procedure for stabilization, he presented with pain, limited range of motion, and weakness in the affected shoulder. Isokinetic evaluation correlated with the physical examination findings of a postoperative strength deficit during internal rotation of the humerus. Active Release Techniques Soft Tissue Management System was applied twice weekly for 2 weeks. The patient was instructed not to alter his daily routine, and no additional rehabilitation was instituted other than the specified regimen of Active Release Techniques. A follow-up isokinetic test displayed a reduction of the initial internal rotation deficit from 28.4% to 3.6% at 120° per second, 11.9% to 1.8% at 180° per second, and from 9.0% to 6.2% at 300° per second. The results seen in this case report warrant larger clinical trials of the Active Release Techniques in the postoperative management of the shoulder, and the author recommends their inclusion as a standard application in the rehabilitation of the postoperative shoulder.*

key words: Shoulder; Active Release Techniques; Rehabilitation; Isokinetics

INTRODUCTION

Management of the postoperative shoulder currently focuses on restoring strength and flexibility through various active strengthening and passive flexibility protocols.[1-6] Unfortunately, current strengthening and flexibility protocols have failed to take into account the pathological soft tissue changes that occur from the operative procedure itself. Recognizing deficits resulting from treatment (in this case surgery) is an integral step in the rehabilitative process.[3] Soft tissue alterations have been mentioned in the literature, but little has been published on the specific application of soft tissue techniques as part of the rehabilitative process.[3,4,6] Kibler,[3] in a comprehensive paper on shoulder rehabilitation, discusses "soft tissues" with terms such as "tissue healing" and "muscle inhibition" but does not address cellular changes in the soft tissues as a result of injury or surgery, nor does he discuss a remedy for such changes.

Conroy and Hayes[6] studied the effect of glenohumeral joint mobilization on patients with primary impingement syndrome. Their study treatment included soft tissue techniques such as effleurage, friction massage, and kneading. However, their main focus was not to study the effects of the soft tissue techniques, because their treatment also included heat, joint mobilization, active range of motion, and physiological stretching and strengthening exercises. They concluded that joint mobilization, when combined with the previously mentioned therapeutic interventions, may not improve function in patients with primary impingement syndrome.

Green et al.[7] reviewed the literature of randomized controlled trials for "common interventions for shoulder pain." They failed to retrieve any such trials examining the efficacy of any specific soft tissue technique.

Leahy and Mock[8] described cellular changes in the subscapularis muscle resulting in impingement syndrome and a manual approach toward resolution of those changes. Several papers

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discuss the successful application of active release techniques for the treatment of overuse and repetitive strain-type injuries in the shoulder.[8-10] The role that soft tissue techniques play in the rehabilitation of postoperative cases remains undefined.

This paper discusses the specific application of the Active Release Techniques Soft Tissue Management System[11] in the treatment of the painful postoperative shoulder. Isokinetic peak torque values were used as a means of outcomes assessment.

CASE REPORT

History

A 26-year-old right-hand-dominant man was seen in the New York Chiropractic College campus health center approximately 2 years after surgery. His chief complaint was "stiffness and decreased range of motion" in the left shoulder secondary to the previously stated surgical procedure.

His history revealed that he had been involved in a motorcycle accident approximately 2 years earlier, during which he suffered a first-time traumatic dislocation of the left shoulder. He was seen in an emergency room, where plain film radiographs confirmed an anterior dislocation of the left glenohumeral joint. He was informed, and manual relocation was performed by the emergency room physician. After a 3-month period of rest and frequent episodes of recurrent dislocation, the patient opted for surgical stabilization approximately 5 months after injury. A Bankart procedure[12] was performed. The patient underwent 8 months of physical therapy after surgery, consisting of ultrasound to the posterior aspect of the shoulder, passive and active range-of-motion exercises using a T-bar, Codman's exercises, wall walking, Theraband exercises, and finally Cybex isokinetic training.

Since the injury and surgical stabilization, he continues to have chronic pain in the posterolateral aspect of the left shoulder. He denies having radiating pain or nocturnal pain. Dejerines triad is absent. His main concern remains lost range of motion and pain during exercise, in particular weight training.

Examination

The patient was approximately 74 in. tall and weighed 234 pounds. Vital signs, examination of the cervical spine, and the neurological examination were all within normal limits. Examination of the left shoulder revealed a reduction of forward flexion, internal rotation, and external rotation. The Hawkins-Kennedy sign was positive for impingement at the coracoacromial arch.[13] Jobe's test was positive for infraspinatus tendinitis, eliciting posterior shoulder pain. The patient could not perform Gerber's lift-off test[14] on the affected side, indicating a lesion of the subscapularis muscle; consequently, his Gerber push test was graded as 3 /5. Manual muscle testing revealed the supraspinatus to be 4/5 when tested in the thumbs-down (empty-can) position (Jobe's maneuver)[15] and 4+/5 in the thumbs-up (full-can) position.[16] The subscapularis was 4/5 with pain when tested in scaption and 0° of rotation. The infraspinatus and teres minor were 4/5 when tested in scaption at 45° of external rotation without pain. Palpation of the teres minor revealed altered tissue texture and motion in relation to the triceps and infraspinatus. Palpation of the subscapularis muscle revealed altered soft tissue texture and motion with relation to the serratus anterior muscle and reproduced the patient's complaint of posterolateral shoulder pain.

The patient was diagnosed with a postoperative impingement syndrome. This was believed to be due primarily to subscapularis weakness secondary to postoperative soft tissue changes (in texture and motion). Also contributing to the soft tissue changes was iatrogenically induced trauma associated with the modified Bankart procedure using a subscapularis split.[12] This resulted in surgically induced muscle inhibition.[17] The initial trauma of the anterior dislocation, chronic Bankart lesion, and operative and postoperative bleeding with subsequent consolidation and postoperative immobilization played an additional role in the patient's postoperative outcome.

To lend objectivity to the rotator cuff muscle dysfunction, the patient was scheduled for a BIODEX (Biodex Medical Systems, Inc., Shirley, NY) isokinetic test of the internal and external rotators of the shoulder. He was tested in scaption at 45° elevation at isokinetic speeds of 120, 180, and 300 d/s.[18] The results revealed a strength deficit of the internal rotators of the left shoulder when compared with the unaffected right shoulder (Table 1).

The patient was then treated twice per week for 2 weeks with the Active Release Techniques Soft Tissue Management System.[11] Treatment was directed to the muscles of the rotator cuff, with an emphasis on the subscapularis. All treatments were performed by the author, a credentialed provider and instructor of active release techniques.

Table 1
Initial Isokinetic Test: Peak Torque

	Torque		
	120 d/s	180 d/s	300 d/s
Right shoulder (ft lb)	61.7	47.1	45.6
Left shoulder (ft lb)	44.2	41.5	41.5
% deficit	28.4	11.9	9.0

d/s, degrees per second.

Table 2
Comparison Isokinetic Test

Speed	Right (ft lb)	Left (ft lb)	% Deficit
120 d/s (test 1)	61.7	44.2	28.4
120 d/s (test 2)	78.3	75.5	3.6
180 d/s (test 1)	47.1	41.5	11.9
180 d/s (test 2)	72.7	71.4	1.8
300 d/s (test 1)	45.6	41.5	9.0
300 d/s (test 2)	71.5	67.1	6.2

d/s, degrees per second.

The patient was instructed not to alter any other aspects of his daily routine. He was not provided with any recommendations for strengthening or flexibility. The goal was to eliminate any other factors with the exception of the manual treatment.

The patient was then scheduled for a follow-up BIODEX test. He was positioned as per the initial test. The results shown in Table 2 reveal a change in internal rotation deficit as follows: from 28.4% to 3.6% at 120 d/s, from 11.9% to 1.8% at 180 d/s, and from 9.0% to 6.2% at 300 d/s.

DISCUSSION

The anterior capsulolabral avulsion secondary to anterior shoulder dislocation or Perthes-Bankart lesion (commonly referred to as the Bankart lesion) was first described by Perthes in 1906[19] and later by Bankart in 1923[20] and 1938.[21]. Bankart[20,21] described the labral lesion as a pathological etiology of recurrent anterior shoulder dislocation. Taylor and Arciero,[22] using a classification scheme developed by Baker et al.,[23] described the Bankart lesion to be a pathological change resulting from first-time traumatic anterior shoulder dislocation. Baker[23] described three types of Perthes-Bankart lesions (Table 3). The patient described in the case report had what was categorized as a type III Perthes-Bankart lesion involving complete detachment of the capsulolabral complex. This is consistent with Taylor and Arciero's findings on arthroscopic examination, in which 61 of 63 (97%) patients examined displayed hemarthrosis and type III detachments of the capsulolabral complex from the glenoid rim.[22]

The concept that the subscapularis plays a vital role in anterior stabilization of the glenohumeral joint has been well described. Its role in recurrent shoulder dislocation and its function as a dynamic stabilizer have been studied extensively.[24-29] Jens[29] described the role of the subscapularis in shoulder instability in 1950. This was later confirmed by Depalma et al.[25] in 1967. DePalma et al. studied 38 consecutive shoulders operatively; all 38 cases displayed what they called

Table 3
Baker Classification: Perthes-Bankart Lesions

Type I: Capsular injury
Type II: Capsular injury with partial labral detachment
Type III: Complete detachment of the IGHL–labral complex

"definite increased laxity and decreased tone." They also described partial tearing of the inferior fibers of the subscapularis tendon from its bony insertion. Moseley and Overgaard[30] reported similar findings of "laxity" in their study. It is these types of often-ignored lesions that can start the process of "muscle inhibition," setting the patient up for a dysfunctional postoperative outcome.

Symeonides[24] showed histological evidence of "healed post-traumatic lesions" in the subscapularis muscle at the time of surgery. He also tested tone in the subscapularis muscle by applying galvanic stimulation at surgery with the arm in abduction and lateral rotation. He did not compare the surgical shoulder with the nonsurgical shoulder but tested it relative to the supraspinatus muscle. The injured subscapularis was found to produce a weaker contraction than the supraspinatus on the same shoulder.

Burkhead and Rockwood,[31] as well as Aronen and Regan,[32] studied rehabilitation programs for patients with traumatic dislocations of the shoulder. Burkhead and Rockwood found 12 of 74 shoulders (16%) to have a good or excellent result with a rehabilitation program. Their program of rehabilitation did not include any particular soft tissue management system. Aronen and Regan reported a 75% success rate in the treatment of first-time anterior dislocations using a program of rehabilitation. Although they did not use any particular soft tissue technique as part of their program, they did emphasize strengthening of the shoulder internal rotators and adductors.

Literature regarding the management of the postoperative shoulder by manual means is lacking. Addressing the subscapularis from a manual approach has been discussed for overuse conditions in both the swimming and baseball populations[8,9] but not in the postoperative population.

In 1991, Leahy and Mock[8] discussed the role of the subscapularis muscle and its pathobiomechanics as an etiology of impingement syndrome in swimmers. It was at this time that active release techniques first appeared in the peer-reviewed literature. Active release techniques were introduced as myofascial release technique.[8] Because of the ambiguity of myofascial release technique in the literature, Leahy changed the name to Active Release Techniques to reflect the technique's function and to distinguish it from the menagerie that has become myofascial release technique.[10]

Buchberger[9] coined the phase "scapular dysfunctional impingement syndrome" in the baseball population in 1993. Unlike Leahy and Mock, who described a mechanism of injury secondary to tearing, Buchberger described a process of fibrosis secondary to friction between the subscapularis and serratus anterior. Although two different mechanisms were described, the treatment approach and outcomes were similar in both papers. Using the procedure followed by Leahy and Mock and Buchberger, it may be concluded that active release techniques represent an effective method of manually reducing both pre- and postoperative fibrosis in the scapulothoracic region.

Despite the data presented in this report showing a post-treatment increase in peak isokinetic torque values, the theory presented is not one in which the technique made the muscle stronger. Rather, the concept presented is that application of the technique in question removed a source of mechanical resistance (scapulothoracic fibrosis), allowing the muscle to function at its highest available potential.[8]

Kibler[3] noted "scapular dyskinesis" secondary to muscle inhibition in the serratus anterior and lower trapezius muscles. Buchberger[9] previously described a concept of muscular inhibition, stating that "scapulothoracic adhesion first creates an anatomical block of acromial lift by preventing the scapula from freely rotating about the thorax. The limited scapular rotation results in weakness and atrophy of the subscapularis and serratus anterior, causing further reduction in the acromial lift and force couple mechanism."

Warner et al.[33] in 1990 performed isokinetic evaluations on normal shoulders as well as shoulders with impingement and shoulders with instability, finding increased external/internal rotation strength ratios in patients with mechanical impingement and another group of patients with glenohumeral instability of traumatic origin. Bak and Magnusson[34] reported similar findings in a group of symptomatic elite swimmers when compared with normal groups, as well as with the asymptomatic contralateral shoulder. These findings are consistent with the data presented in this case study.

Internal rotation is commonly lost in the symptomatic shoulder, both postoperative and nonoperative.[35,36] This lost range of motion may be another source of muscle inhibition in the subscapularis muscle. Reduced internal rotation can prevent the subscapularis from functioning through its full range and subsequently can lead to weakness in that range. In addition to active release techniques, flexibility exercises in the form of behind-the-back stretching (Fig. 1) and strengthening exercise using the rotational push-down (Fig. 2) may help to restore full range of motion, strength, and volume to the subscapularis muscle using the lift-off principle[14] as a basis for application.

CONCLUSION

This case demonstrated the positive effect that a particular soft tissue technique can have on the function of a postoperative shoulder. A 24.8% reduction of isokinetic peak torque deficit for internal rotation after four treatments is encouraging. The 2.8% reduction at 300 d/s is less encouraging. There is a theoretical explanation. The patient was not a high-velocity throwing or striking athlete. His main form of training was traditional isotonic exercise using free weights and

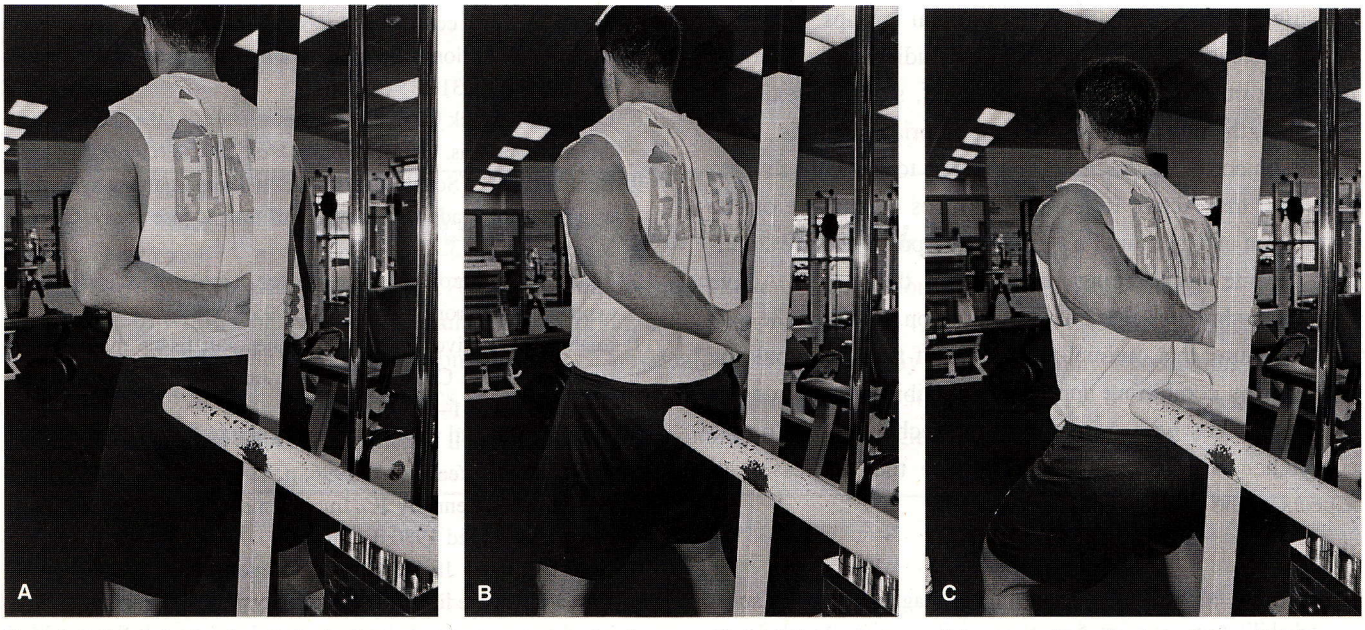

Figure 1. *Behind-the-back stretch.* **A.** *Start position: grasping the doorway.* **B.** *Middle position: walking away from the door frame.* C. *Extreme end-range position: squatting maneuver.*

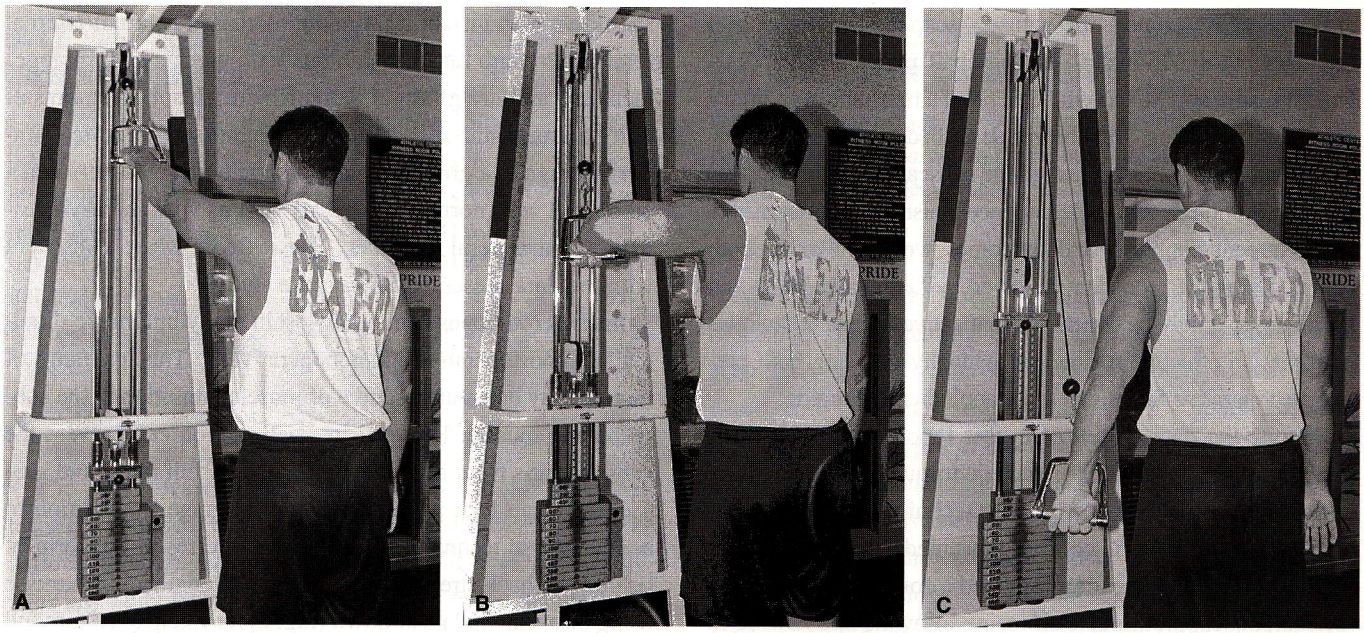

Figure 2. *Rotational push-down.* **A.** *Start position.* **B.** *Horizontal shoulder extension at 90° of abduction.* **C.** *Adduction, elbow extension, and shoulder internal rotation.*

weight-training machinery. Isotonic exercise is not based on high-velocity movements. It can be concluded that because this individual was not trained in the range of 300 d/s, the small improvement displayed was a result of a training deficit in this area. The dramatic change in strength deficit seen at 120 d/s correlates with the patient's mode of strength training at slower speeds.[37,38]

I believe that a strong case has been made for the integration of soft tissue management into the postoperative rehabilitation process. Although a positive result was demonstrated in this case report, larger populations of the postsurgical, nonsurgical (symptomatic), and normal groups receiving Active Release Techniques should be studied against groups receiving other management techniques, such as flexibility and strengthening exercises, with appropriate controls.

The objective of this case report was to gain insight into the effect that Active Release Techniques could have on the restoration of function of a symptomatic postoperative shoulder. Despite encouraging results from the use of Active Release Techniques alone, it is my opinion, based on the current literature, that optimal restoration of function would be achieved by combining appropriate flexibility and strengthening regimens with Active Release Techniques to form a comprehensive rehabilitation plan, one that addresses all aspects of the dysfunctional shoulder.

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