Post-operative Rehabilitation Following Arthroscopic Rotator Cuff Repair

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INTRODUCTION

Up to this point in the text, the spectrum of arthroscopic approaches to the rotator cuff has been expertly detailed. While these arthroscopic techniques have altered our approach to rotator cuff repairs and have improved upon the open procedures previously considered the gold-standard, the principles of rehabilitation have not changed as dramatically. As Neer stated, "It is not enough to perform a technically perfect, clean shoulder reconstruction. The shoulder surgeon must have an equal fervor for preventing adhesions and strengthening muscles while preserving the integrity of his or her repair [9]." In addition, "… because a good rehabilitation program is critical … in restoring optimum function in this complex joint, the shoulder surgeon must not only understand this type of rehabilitation but also remain actively involved with the patient and therapist to make it work." There is now more science available to guide the shoulder surgeon and therapist, but there remains an art to the process.

The post-operative rehabilitation following arthroscopic rotator cuff repair begins pre-operatively when the shoulder surgeon explains to the patient the planned operative procedure, the peri-operative course and the demands of the post-operative rehabilitation. Questions about the planned procedure, with any intra-operative decisions to be made, are answered. In this manner, the patient's and the shoulder surgeon's expectations are understood by both parties. This includes as frank discussion of the benefits and risk, including the risk for re-tear. The initial post-operative home exercise regimen can be reviewed at this time. In addition, the outpatient pain management program is discussed, including the senior author's preference for anesthetic infusion with lidocaine into the subacromial space for approximately 48 hours following surgery [14]. If there are any concerns that the patient cannot, or will not, comply with the post-operative course outlined for the planned procedure, addressing this pre-operatively is clearly more desirable.

The primary goal of a post-operative rehabilitation program is to control pain, protect repaired tissue during the healing process, restore function and avoid recurrence of symptoms. The size of the tear, the quality of the tissue and bone and the quality of the repair, as well as the patient's abilities and motivation, are taken into account by the shoulder surgeon as the rehabilitation program is initiated and progressed. The approach to rehabilitation following a secure repair in a young patient with strong bone and healthy tendon should differ from the approach in an older patient having a repair of the same size tear with tendon and bone that is

of poorer quality. Thus, general principles are applied to each patient and the repair in an individualized fashion.

Typically, the sling is maintained for 4-6 weeks, with the longer time period used for large and massive tears. (Abduction pillows for large and massive tears may decrease tendon contact to the prepared sulcus and are not used for arthroscopic repairs at this time by the senior author, including the setting of a double-row repair.) Passive range-of-motion (ROM) usually begins within the first 24-48 hours in small- and medium-sized tears, based on patient ability and comfort. The shoulder surgeon and physical therapist perform ROM in the supine position, within the limits determined at the time of surgery. With repair of a small tear, the limits on elevation and external rotation may only be present for the first few weeks following surgery. However, in medium and larger tears, the limits determined at the time of surgery must be respected for a longer period of time. Limited active-assisted ROM exercises begin as pendulum exercises and initial supine self-assisted exercises. This is delayed in large tears, and massive tears are delayed even longer, again depending upon factors noted above.

Pain will interfere with the recovery, and steps to diminish pain are essential. Analgesics are utilized to allow for earlier progression of motion. Initially, avoiding IR, arm extension and reaching behind the back following a rotator cuff repair is helpful to limit tension on the repair and to decrease pain. Cryotherapy is essential initially to control pain and swelling, and following exercises and activities during the healing process to diminish muscle soreness. Cautioning patients on specific activities to avoid is advantageous.

A physician-supervised physical therapy rehabilitation program is an important component of the recovery process. The shoulder surgeon must communicate with the physical therapist to set initial limits, based on the intra-operative impression of the repair, and to advance the rehabilitation. This interaction between the shoulder surgeon and treating physical therapist will allow the therapist to fully understand the type of procedure, size of the tear, quality of repair, any concomitant procedures performed, and the shoulder surgeon's rehabilitation guidelines for each rotator cuff repair. The physical therapist is the eyes and ears for the shoulder surgeon during the rehabilitation process and must communicate back to the shoulder surgeon any necessary information regarding the patient's progress, or lack there of [6]. It is imperative for the treating physical therapist to understand the biomechanics of the shoulder and the forces that are placed on the rotator cuff during specific exercise. These principles will allow the physical therapist to use the general postoperative guidelines to develop an appropriate and individualized program for the patient that will allow the repair to heal properly

and restore the range of motion and strength, as well as maintain glenohumeral stability and proprioception, which is essential for normal shoulder function. Programs must also be tailored to the individual for return to his or her previous activity. The shoulder surgeon and physical therapist must also serve to advise, encourage and, even, caution the patient throughout the recovery.

During the initial stages of healing following a repair, gaining motion is the focus of the rehabilitation. Phase I, or the acute or protective stage, is generally designed to manage post-operative pain and inflammation, as well as protect the repair, initiate passive ROM then active-assisted ROM exercises for the involved joint, initiate isometrics for the unaffected muscles, and resume motion to the uninvolved joints, especially the elbow, wrist, and hand. Initial motion limits are based on the shoulder surgeon's intra-operative assessment of the safe zone for motion following the repair. For example, the secure repair of a medium-sized tear in a young patient with good quality bone and tendon may be allowed a greater passive ROM than the repair of a medium-sized tear in an elderly patient with poorer quality bone and tendon. Advancing these limits as tissue healing progresses are based on the shoulder surgeon's assessment of the patient's overall progress. The duration of this phase varies by the size of the repair. Pulley exercises are only initiated toward the end of this phase to avoid active muscle recruitment that can occur when started too early [7].

Phase II, the subacute or recovery stage, begins when sufficient tissue healing is achieved, again depending upon the size of the tear and the quality of the tissue and its repair. The timing is clearly much sooner following a repair of a small 1 cm rotator cuff tear than following repair of a large 4 cm rotator cuff tear. One might also be more confident with advancing the rehabilitation in the setting of a secure double-row repair compared with a single-row repair in a similar-sized tear. This phase includes active ROM exercises, advanced stretching to restore full motion, and light, then more advanced, strengthening of the affected muscles and the entire shoulder girdle. Judicious application of heat promotes soft-tissue flexibility and facilitates stretching. Application of cold following exercises and activities is encouraged to diminish pain and swelling. Posterior capsular tightness should not be overlooked and should be addressed with specific stretching exercises of the posterior capsule. In addition, joint mobilization techniques for the posterior capsule can be used. Slow, gradual stretching exercises are preferred over rapid, ballistic-type movements. Pain control should be re-assessed at many intervals during the recovery to insure the patient's needs are met. Slow down if the patient's pain does not allow steady progress. Steady encouragement and positive

reinforcement is essential, especially if the patient expresses frustration with the perceived slow recovery. Phase III, or functional stage, maximizes stretching and strengthening, and adds sports- or activity-related exercises, as well as a maintenance program. Activities are resumed in stages, based upon the demands such activities will place on the repair. Insure the patient understands that the gains post-operatively do not always follow a smooth and steady progression, and that the course can fluctuate with the addition of new exercises and advancing to each new stage, as well as with added activities of daily living. If the patient can look back week by week and appreciate his or her progress, this can be an encouraging perspective.

A diligent home exercise program is of equal importance to the physical therapy visits. There are specific exercises at each stage that compliment the supervised program to maintain the gains achieved thus far and to build upon theses gains. The physical therapist, as well as the shoulder surgeon, guide the patient with the individualized home exercise program. As a general guideline, ROM exercises should be performed more frequently on a daily basis than strengthening exercises. Rehabilitation tools, such as a stick, a pulley and, eventually, weights and elastic bands facilitate the home exercise program.

Specific accommodations are made when a biceps tenotomy or tenodesis is performed, and when a subscapularis repair is performed. When the biceps is treated as part of an arthroscopic rotator cuff repair, either at its superior glenoid anchor or along the course of the tendon with a tenodesis or tenotomy, biceps-active components of the program are not started until healing progresses. The subscapularis is more often fixed as part of an arthroscopic repair of the posterosuperior rotator cuff than as an isolated repair. Under these circumstances, passive ER is progressed more slowly and active IR is delayed [15]. More emphasis is placed on the specific arthroscopic subscapularis repair protocol if it is repaired in the setting of a small supraspinatus repair, than if the subscapularis is repaired in the setting of a massive supraspinatus and infraspinatus repair. In addition, the repair of a full thickness subscapularis tear that involves 100% of the tendon is progressed more slowly than a full thickness subscapularis tear that involves only the upper 50% of the tendon, which is similar in concept to the rehabilitation approach following the repair of a large- or massive-sized tear involving the supraspinatus and infraspinatus compared with only a small- or medium-sized tear of the supraspinatus.

An understanding of a tissue's response to injury and its mechanisms of repair is quite helpful when designing a rehabilitation program. The healing process proceeds in much the same manner for all soft tissues, with a surgical repair creating a more controlled healing

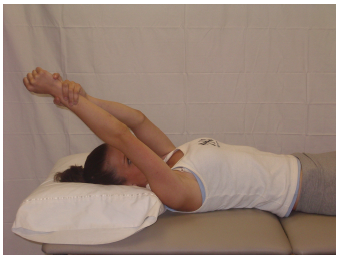
environment [4]. The initial inflammatory phase is followed by a reparative phase. This healing tissue is weaker and at risk of re-tear early on, so a careful regimen to avoid overstressing the repaired tissue is essential. A six week time frame for this initial period has been described. The remodeling phase then progresses for many months and will influence decisions regarding progression of the rehabilitation program and return to activities.

SUGGESTED POST-OPERATIVE PROTOCOLS

The protocols are divided into sections as follows: repair of small tears (<1 cm), medium tears (1-3 cm), large (3-5 cm) & massive tears (>5 cm), subscapularis tears, and biceps tears. (The indications of tear size for separate categories are general approximations.) Post-operative rehabilitation for repair of a small rotator cuff tear repaired arthroscopically is described in full detail. Post-operative rehabilitation of medium and large & massive rotator cuff tears repaired arthroscopically are described by how they differ from the protocol of repair of a small tear. Post-operative protocols in outline form can be viewed at www.LIshoulder.com/ARCRrehab.htm. The suggested protocols are not intended to include each and every detail for each time period described, but are intended to include the most relevant steps. The time period refers to the seven days of the particular week noted. As examples, Post-op Week 1 includes days 1-7 and Post-op Week 7 includes days 43-49.

Arthroscopic Repair of Isolated Small Tear Protocol

During Post-op Week 1, there is a necessary focus on pain control for patient comfort. Application of cryocompression to decrease pain and swelling, including the extravasated arthroscopic fluid, is routine. Pendulum exercises begin as simply dangling of the arm, and then progress. Gentle pain-free passive ROM by the shoulder surgeon and physical therapist begins in the supine position within the defined limits. During Post-op Week 2, supine active-assisted ROM in external rotation (ER) with a stick and in self-assisted elevation is started {FIGURE 1A, B & C}.


External rotation should be initiated with the arm abducted 30-45° from the body to diminish tension on the repair [3]. Active ROM of the wrist and hand, as well as active ROM of the elbow, assuming the biceps tendon or the superior labrum is not involved in the repair, is instructed. Modalities, such as electrical stimulation, can be utilized for pain modulation. Clear instructions about restrictions include avoiding any lifting, pushing, pulling, carrying or any active ROM. To prevent extension of the arm, particularly in the supine position, a pillow is placed behind the elbow to keep the arm more level with the abdomen. Internal rotation (IR) beyond the stomach and sleeping on the operated shoulder are also avoided.

During Post-op Week 3-4, pain control, and the various alternatives available to the patient, is more settled and understood by the patient. Pendulum exercises continue, and supine active-assisted ROM in ER with a stick and in self-assisted elevation are progressed within the determined ranges. The use of the pulley in the scapular plane can be considered if there is quality ROM (with minimal scapula hike indicating limited scapula substitution pattern) and its use does not cause substantial pain. Pain-free sub-maximal isometrics of the uninvolved tendons can also be added. Scapula control exercises in the side-lying position with the physical therapist are added to restore the scapula musculature necessary to re-establish scapula stability and the force couples needed for arm elevation [5,8]. Active ROM of the elbow, wrist and hand continues. Restrictions from Post-op Week 1 are maintained.

During Post-op Week 5-6, the patient should work toward achieving near-full ROM. Moist heat may be utilized prior to ROM exercises. If the patient is having difficulty restoring ROM, pain can often be a limiting factor and must be addressed or the rehabilitation slowed down. Premedicating with analgesics prior to exercises should be utilized. Supine stick active-assisted elevation is added and previous AAROM exercises are continued. Glenohumeral and rhythmic stabilization exercises are initiated to restore proprioception and neuromuscular control of the shoulder [16]. Prone row and prone extension AROM to neutral without weight may begin, and active ROM in the side-lying position for internal and external rotation maybe considered in this stage. Lifting restrictions continue, as well as continued avoidance of both

extension beyond neutral and IR. Patients who feel they should be progressing faster are informed of the healing process, reminded of the gains they have made and cautioned against advancing beyond the instructed limits.

During Post-op Week 7, the next phase begins and the emphasis of the rehabilitation program transitions to restoring active ROM. Active ROM with elevation in the scapula plane is initiated, beginning with gravity-eliminated (supine and possibly side-lying) positions and progressed (semi-recumbent, sitting and/or standing) [6]. Elevation with the elbow flexed initially, to shorten the lever arm, will minimize the demand on the glenohumeral musculature [10, 17]. Supported active ROM exercises have been demonstrated to have less electromyographic activity on the supraspinatus than unsupported exercises and, therefore, should be used initially to restore AROM [17]. These principles are even more important with larger tears. Rarely is active ROM added earlier, based on the milestones achieved and the shoulder surgeon's comfort. No weights or resistive bands are used at this point. The weight of the arm, especially in a large individual, is sufficient. Passive ROM and active-assisted ROM are added for internal rotation and extension. Passive ROM and active-assisted ROM for all planes of motion are continued and advanced to maximize and maintain ROM. Light biceps (if not contraindicated) and triceps strengthening is added.

During Post-op Week 8-9, light resistive shoulder strengthening exercises are initiated if the patient demonstrates normal active ROM in these planes without abnormal or substituted movement patterns [8]. Starting with a 1 lb. dumbbell, side-lying IR and ER exercises, prone extension and row exercises, and supine scapula protraction (punches) exercises are added. Elastic bands, beginning with the least resistance, are used for ER, IR, shoulder extension to neutral, scapula retraction, and advanced scapula protraction exercises (standing scapula punches and dynamic hug) [1]. Elevation in the scapula plane in the "open can", thumb-up, position {FIGURE 2} is performed initially without weight [11,12].

Only when normal active ROM without substitution patterns (scapula hike) is present is resistance added in the form of light weights or low resistance bands. Repetitions and sets of

exercises are increased before weight or resistance is increased. Scapula stabilization exercises are continued and progressed. An upper body ergometer (UBE) is added later, which helps with motion, but also contributes to muscular endurance. Closed chain exercises are also performed. Advanced stretching in all planes is encouraged, especially for the posterior shoulder and capsule, such as with the sleeper stretch {FIGURE 3}.

During Post-op Week 10-11, the strengthening program is progressed based on the patient's achievements. Stretching and closed chain exercises continue, and proprioceptive neuromuscular facilitation (PNF) patterns are started, carefully. By Post-op Week 12-13, strengthening exercises are advanced, as are the open and closed chain exercises. ROM in all planes is monitored to insure motion is maintained. Any deficiencies are addressed. Exercises directed at specific functional activities are added as appropriate, with considerations given for return to work. Sports-specific activities and plyometrics are added. For the recreational athlete, return to lower-extremity sports can be considered by 4-5 months, with upper extremity sports involving the operated extremity delayed to 7-9 months, if strength, endurance and motion allow. Elite athletes will require additional training and preparation for return to sports participation, and these programs are not addressed here.

As far as work is concerned, return to work in a sling can begin when desired. An executive who can be driven to work and perform the required duties while maintaining the sling can start within the first weeks. However, the sooner a patient returns to work, the less time he or she has available to focus on the important recovery process. Return to work for a manual laborer, who does not have a light duty job option that precludes lifting with the operated arm, should be delayed until the milestones are achieved that will allow him or her to perform the particular work duties required. These include, primarily, the weight requirements, activity in the overhead position or frequency of repetitions that certain jobs entail. The earliest this should be achieved is 4 months, but it often takes 5-6 months to achieve the necessary fitness for return to work with limited risk for the heavy duty manual laborer.

Arthroscopic Repair of Isolated Medium Tear Protocol

The general guidelines for rehabilitation following repair of a medium tear use the same components as the repair protocol following a small tear, but introduce many at later stages. Post-op Week 1-2, the guidelines are the same, except self-assisted supine elevation is delayed until Post-op Week 3-4. ROM is often limited more with repair of medium tears, based on the intra-operative assessment, than with repair of small tears. The shoulder surgeon needs to guide the physical therapist and instruct the patient more carefully about advancing ROM limits in the earlier stages, and all should expect the return of motion to take longer with tears of greater size. Isometrics and pulley exercises are delayed from Post-op Week 3-4 to the next time period. Glenohumeral and rhythmic stabilization exercises, as well as prone row and prone extension to neutral can begin in Post-op Week 7, but side-lying IR and ER active ROM exercises, are delayed until the next time period. The sling is now used only for activity in public, but restrictions on lifting continue. Initiating active ROM in the supine position may begin Post-op Week 8-9 in some repairs of medium tears, but this might be delayed in others, and ROM is always progressed at a slower pace. This trend continues into Post-op Week 10-11. Stretching continues with particular attention paid to the posterior capsule. Strengthening of tendons not involved in the repair are started by now, but strengthening for elevation is usually delayed into Post-op Week 12-13, and only if near normal active ROM, without substitution patterns, has been achieved. Introduction of PNF patterns, closed chain exercises and the UBE may also begin in this time period, again if near normal active ROM, without substitution patterns, has been achieved. Guidelines for Post-op Week 14-15 include light functional activity as appropriate. Considerations for return to work in light duty manual labor settings are made, but heavy duty manual labor is usually delayed, at least, until 5-6 months following repair, with erring on the side of caution.

Arthroscopic Repair of Isolated Large & Massive Tear Protocol

The general guidelines for rehabilitation following repair of large and massive tears use the same components as the protocol following repair of small tears, but introduce most at later stages. Post-op Week 1-2 only includes wrist and hand exercises, and elbow if not contraindicated. The course is much slower post-operatively, with only dangling the arm at the side allowed for showering. In many cases, a supervised therapy program is not initiated until

5-8 weeks post-operatively. In these types of repairs, intra-operative assessment and patient issues are more important factors to consider concerning the start of the supervised rehabilitation program. Therefore, large repairs might begin pendulums and passive ROM exercises by Post-op Week 5-6 within determined limits, such as 120° of elevation and 30° of ER. For massive tears, this could be Post-op Week 7 or later. However, if the patient has stiffness that concerns the shoulder surgeon on follow-up at about Post-op Week 4, i.e. substantial limitations of supine elevation and external rotation, gentle passive ROM may be initiated sooner. By Post-op Week 8-9, supine active-assisted ER exercises are often started prior to elevation exercises to protect the repair. Slow, incremental increases in the ROM limits are observed. This is when communication between the shoulder surgeon and physical therapist is even more important. If ROM exceeds the set limits by a substantial amount, the integrity of the repair may be compromised. Pulleys can be considered if there are both minimal pain and available ROM to perform this exercise. Scapula controlled exercises with the physical therapist can begin, as well as submaximal isometrics of uninvolved tendons. Restrictions often continue until post-op Week 10-11, including avoiding extension, IR, active ROM, lifting, pushing, pulling and carrying.

Glenohumeral and rhythmic stabilization exercises, as well as prone row and prone extension to neutral can begin in Post-op Week 10-11. Gravity eliminated active ROM exercises for elevation, ER and IR are considered if patient progress allows. Light biceps and triceps strengthening exercises are also started now, and delayed until this point simply to keep weights and bands away from the patient. By Post-op Week 12-13, restoring full passive ROM is a goal. Active ROM is progressed as able to include gravity resisted positions. Weights and bands are not added until near normal active ROM is achieved. However, side-lying IR and ER exercises, as well as scapula strengthening exercises, may begin without near normal active ROM, as these exercises will assist with gaining strength in elevation. Stretching continues, with particular attention paid to the posterior capsule. By Post-op Week 14-15, active ROM in elevation is progressed with light resistance as able, and PNF patterns, closed chain exercises and UBE are considered. The extended rehabilitation into later weeks includes adding, when able, light functional activities. As opposed to repairs of small and medium tears, the patient must continue both stretching exercises, to maintain ROM and flexibility, and strengthening exercises for a longer period of time. Patients should not expect full return of strength and endurance, particularly if the tear is longstanding. However, substantial improvement over the pre-operative function is usual with successful repairs, even including light activities in the

overhead position. Light duty manual labor may resume by 5-6 months. Patients with heavy duty manual labor jobs may never return to their previous level of function.

The above protocol is not altered when the subscapularis is involved in the repair. The restrictions on passive ER, into Post-op Week 8-9, and active IR, into Post-op Week 10-11, afford the necessary protection of the subscapularis repair. It is important that the physical therapist is aware of this component of the repair.

Arthroscopic Repair of Isolated Subscapularis Tear Protocol

The general guidelines for rehabilitation following repair of an isolated subscapularis tear vary based on both the amount of tendon involved in the tear pattern and the repair. The repair of an isolated subscapularis tear that involves 50% of the tendon should be more secure than repair of an isolated subscapularis tear that involves 100% of the tendon. Therefore, the protocols are divided into these two categories.

During Post-op Week 1-2 following the repair of an isolated subscapularis tear that involves 50% of the tendon, passive ROM is begun within limits, especially ER, as determined by the shoulder surgeon's intra-operative assessment, which must be communicated to the physical therapist. Supine active-assisted ER is maintained within the established limits. Supine active-assisted elevation is started and advanced as tolerated, unless limits are established by the shoulder surgeon. Wrist and hand active ROM begins, and the elbow is included if the biceps is not involved in the repair. Restrictions include any active ROM, especially IR; extension and IR beyond the stomach; sleeping on the involved side; and any lifting, pushing, pulling and carrying. For Post-op Week 3-4, passive and active-assisted ROM in elevation is usually advanced. Limits are maintained for ER as previously established. Pulley in the scapula plane is added if there is quality ROM (limited scapula hike) and minimal pain. Scapula-control exercises in the side-lying position can begin. Submaximal isometrics, excluding IR, are initiated. Otherwise, the same restrictions from Post-op Week 1-2 continue.

In Post-op Week 5-6, active ROM is started in all planes, except IR, beginning with gravity-eliminated positions. For example, this includes ER, as the posterosuperior cuff was not involved in the repair. Limits in ER, and possibly elevation, can be increased by the shoulder surgeon, but still need to be monitored. Rhythmic stabilization exercises are started, with the exception of those involving IR. Lifting, pushing, pulling and carrying continue to be restricted, as does active IR. At Post-op Week 7, the limits of passive and supine active-

assisted ER can be advanced as tolerated. Active and passive extension past neutral and passive IR beyond the stomach are added. Strengthening of the posterior shoulder muscles (external rotators, posterior deltoid, and scapula muscles) maybe added when near full active ROM, excluding IR, is achieved, beginning with light resistance and progressed over time. Light biceps (if not contraindicated) and triceps strengthening are added. Active IR is carefully added in a gravity-eliminated position, such as sitting. At this point, the sling is usually discontinued.

During Post-op Week 8-9 a goal is to progress toward full passive, and active, ROM in all planes. Stretching of the posterior capsule should be considered, though the patient may not tolerate these positions for stretching in this time period. Active IR is progressed from sitting to side-lying on the affected side to add the element of gravity. Strengthening of the uninvolved tendons is progressed, including the supraspinatus and deltoid, and UBE is added. Post-op Week 10-11 adds resistive IR exercises, and continues to maximize ROM and strength in all planes [2]. Closed chain exercises and PNF patterns can be added as tolerated. During Post-op Week 12-13, ROM is maintained and strengthening continues. Light functional activities are considered. For Post-op Week 14-15 and beyond, exercises directed at specific functional activities are added as appropriate, with considerations given for return to manual labor. Sports-specific activities and plyometrics are added. For the recreational athlete, return to lower-extremity sports can be considered by 4-5 months, with upper extremity sports involving the operated extremity delayed to 7-9 months, if strength, endurance and motion allow.

Following the repair of an isolated subscapularis tear that involves 100% of the tendon, a slower course is followed. Passive and active-assisted ER might begin in Post-op Week 3-4 if the quality of the tissue and repair allow, but are often delayed until Post-op Week 5-6 within limits defined by the shoulder surgeon. These limits continue into Post-op Week 8-9, and possibly longer, again, if the quality of the tissue and repair dictates. However, active ER within these limits can start by Post-op Week 5-6. Passive and active-assisted elevation might also begin Post-op Week 3-4, but at times are delayed until Post-op Week 5-6 within limits defined by the shoulder surgeon. These limits continue into Post-op Week 7 and are progressed more slowly. Active elevation may be delayed until Post-op Week 8-9 and progressed only if quality ROM exists without substitution patterns. Passive and active-assisted IR, as well as extension beyond neutral, are delayed until Post-op Week 8-9. Furthermore, active IR is often delayed until Post-op Week 10-11.

Strengthening of the posterior shoulder muscles (external rotators, posterior deltoid, and scapula muscles) maybe added when near-full active ROM, excluding IR, is achieved, beginning with light resistance and progressed over time. This is often Post-op Week 10-11, but may be Post-op Week 8-9. Light biceps (if not contraindicated) and triceps strengthening are added at the same time. Post-op Week 12-13 adds resistive IR exercises, and continues to maximize ROM and strength in all planes. Closed chain exercises and PNF patterns can be added as tolerated. During Post-op Week 14-15, ROM is maintained and strengthening continues. Light functional activities are considered. For Post-op Week 16 and beyond, exercises directed at specific functional activities are added as appropriate, with considerations given for return to work by 4-5 months for light duty manual labor, and longer for heavy duty manual labor. Patients should not expect full return of strength and endurance, particularly if the tear is longstanding, though substantial improvement over the pre-operative function is usual with successful repairs.

Arthroscopic Treatment of Isolated Long Head of Biceps Tear Protocol

Rehabilitation following an isolated biceps tenodesis would progress in a fashion somewhat faster than that of a repair of a small supraspinatus tear. Passive and active-assisted ROM are progressed as tolerated in all planes, except extension in the first few weeks. Limitations for active motion include active and resistive elbow flexion and supination for six weeks, as well as resisted shoulder elevation [13]. At Post-op Week 7, active elbow flexion is initiated. During Post-op Week 8-9, light resistance can be added judiciously if there are no symptoms with active elbow flexion. Following an isolated biceps tenotomy, the limiting factor is pain in the biceps. As pain resolves, active elbow flexion is initiated, often by Post-op Week 5-6, followed by the addition of light resistance. When biceps tenodesis is performed in addition to a rotator cuff repair, the repair protocol is followed, except that active elbow flexion is delayed for six weeks. In the presence of biceps tenotomy and rotator cuff repair, active elbow flexion is delayed until biceps pain resolves.

SUMMARY

Postoperative guidelines following arthroscopic repair of small, medium, large and massive tears, as well as subscapularis repairs and biceps tenodesis or tenotomy, follow the same general principles that are introduced at different time frames. However, the guidelines must be adapted to each individual patient and the specific tear to insure the best possible outcome. While it clearly demands much of the patient during the postoperative recovery, the postoperative rehabilitation requires an investment of time by the shoulder surgeon and the physical therapist, along with a high level of trust and an open line of communication. The goals should be to promote healing of the repair first, then restore mobility before strengthening is emphasized. Balancing these three important goals in each individual patient reflects the art of the process.

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FIGURE LEGENDS

Figure 1A, B, C Supine self-assisted elevation is demonstrated, with the well arm elevating the operated arm. The operated arm starts away from the body toward the scapula plane.

Figure 2 Elevation in the scapula plane in the “open can”, thumb-up, position.

Figure 3 The sleeper stretch is used to stretch the posterior shoulder and capsule. The patient is lying on the operated side, which stabilizes the scapula, and the shoulder and elbow are at 90° angles. The well arm is used to internally rotate the operated arm toward to the table until the stretch is felt in the posterior shoulder and, then, held there for a 15-30 second count.