Rehabilitation Following Arthroscopic Rotator Cuff Repair: A Review of Current Literature

David Ross, MD
Tristan Maerz, MS
Jamie Lynch, MD
Sarah Norris
Kevin Baker, PhD
Kyle Anderson, MD

Abstract

Physical rehabilitation following arthroscopic rotator cuff repair has conventionally involved a 4- to 6-week period of immobilization; there are two schools of thought regarding activity level during this period. Some authors encourage early, more aggressive rehabilitation along with the use of a continuous passive motion device; others propose later, more conservative rehabilitation. Although some studies report trends in improved early range of motion, pain relief, and outcomes scores with aggressive rehabilitation following rotator cuff repair, no definitive consensus exists supporting a clinical difference resulting from rehabilitation timing in the early stages of healing. Rehabilitation timing does not affect outcomes after 6 to 12 months postoperatively. Given the lack of information regarding which patient groups benefit from aggressive rehabilitation, individualized patient care is warranted.

From the Department of Orthopaedic Surgery, Beaumont Health System, Royal Oak, MI (Dr. Ross, Dr. Lynch, and Dr. Anderson), and the Orthopaedic Research Laboratories, Research Institute, Beaumont Health System, Royal Oak (Mr. Maerz, Ms. Norris, and Dr. Baker).

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Rotator cuff tear is the most common cause of shoulder disability, and the incidence increases with age.[1] Although rotator cuff tears typically are chronic injuries caused by overuse in middle-aged persons, they also can occur in younger persons as a result of trauma during sports, motor vehicle accidents, or falls.[2]

Rotator cuff deficiency can cause significant pain, dysfunction, and disability,[3] and although nonsurgical management is a feasible option for certain elderly patients and smaller tears,[4] surgical repair has been shown to relieve pain and restore function in >90% of patients.[5] In most studies, nonsurgical management has been shown to lead to tear progression, with an increase in tendon retraction, fatty infiltration of the muscles, and degenerative changes, which have the potential to lead to less reliably repairable or even irreparable tears.[4,6]

Physical therapy is an important factor in the clinical success of rotator cuff repair. Large-scale studies have demonstrated that both passive and active range-of-motion (ROM) and strengthening exercises lead to decreased joint stiffness and increased strength.[7] Rotator cuff repair, however, is associated with a significant incidence of rotator cuff re-tears, with reported re-tear rates of 94% in large tears.[3,8,9] Although the re-tears have not been directly attributed to physical therapy, rehabilitation protocols vary in terms of timing and level of intensity. As such, there exist two schools of thought regarding the optimal timing of rehabilitation in the early phase of recovery after rotator cuff repair. The first promotes early/aggressive rehabilitation with higher activity levels to reduce postoperative stiffness and pain. The second recommends more conservative rehabilitation to protect repair integrity.

The Evolution of Rotator Cuff Repair

The surgical management of rotator cuff tear has evolved over the past century. Whereas open rotator cuff repair was the standard of care for most of the 20th century, mini-open rotator cuff repair was introduced in the late 20th century as a less-invasive alternative, with clinical outcomes superior to those of open rotator cuff repair.[10] Arthroscopic rotator cuff repair, the least invasive method, preserves the deltoid, allows for improved visualization of large tears, causes less discomfort, enables earlier return to motion, decreases infection rates,[10,11] and decreases the incidence of fibrous contracture.[12] Although arthroscopic rotator cuff repair is now considered to be the standard technique, mini-open rotator cuff repair is still performed and has demonstrated equivalent clinical results.[13]

Arthroscopic Rotator Cuff Repair

The goal of arthroscopic rotator cuff repair is to restore the biomechanical integrity of the tendon-bone interface while placing the fixation in the anatomic footprint of the rotator cuff on the greater tuberosity.[14] Surgeon-specific variations on arthroscopic rotator cuff repair exist. The principal difference is the number of suture anchors (ie, rows of anchors) used in the fixation of the supraspinatus tendon. Although the choice of single- or double-row repair can be made based on the size of the rotator cuff tear, the decision is usually based on surgeon preference.

In cadaver laboratory studies, double-row repair has been shown to have a larger tendon-bone contact area in the native footprint of the supraspinatus tendon[15] and higher initial fixation strength with less gap formation under cyclic loading than does single-row repair.[16] Changes in the time-zero vascularity of the tendon-bone interface and supraspinatus tendon proper following rotator cuff repair have been documented,[17] and in theory, single-row repair could be less disruptive to the vascular supply in the controversial hypovascular zone of the rotator cuff.[18] Some believe that the hypovascular zone should not be disrupted, whereas others reason that the improved mechanics of double-row repair outweigh the negative effects of disrupting the hypovascular zone. However, this has not been shown clinically. Despite the reported differences in single- and double-row repair, equivocal clinical results have been reported.[5,19,20]

Mechanical and Biologic Factors of Rehabilitation Timing

Rehabilitation protocols following rotator cuff repair have been widely published and used by orthopaedic surgeons and physical therapists.[21,22] Many of these protocols have similar time frames that are based on current understanding of the biologic and biomechanical factors of the injured, repaired, and healing rotator cuff.[23]

Healing of the rotator cuff tendon progresses through three phases: inflammatory (7 days), proliferative (2 to 3 weeks), and maturation and remodeling (12 to 26 weeks).[23,24] It is not fully understood how motion, whether active or passive, is beneficial or detrimental in each of these phases. Conflicting data from animal and human studies assessing the effect of immobilization as well as the lack of conclusive clinical data make it difficult to determine accurate rehabilitation timing. Joint immobilization is associated with transient changes in cortical and cancellous bone structural properties[25] as well as increased shoulder stiffness and, thus, decreased ROM.[26]

Data are conflicting with regard to the effect of immobilization on tendon healing. Gimbel et al[27] indicated that, in rats, supraspinatus repair strength is improved with immobilization. In a rabbit model, Kamps et al[28] showed that immobilization led to decreased remodeling in healing patellar tendons. Palmes et al[29] found decreased load to failure in immobilized Achilles tendon repairs in a mouse model.

Skeletal muscle is also directly affected by immobilization. Fatty atrophy in the supraspinatus muscle belly following rotator cuff tear is well documented, and muscle atrophy

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and fatty infiltration correlate to functional outcomes and re-tear rates following repair.[30] However, the effect of rehabilitation timing on muscle atrophy has not been distinctly studied. Gladstone et al[30] have shown that although muscle atrophy and fatty infiltration correlate negatively to functional outcomes and positively to re-tear rate, neither muscle atrophy nor fatty infiltration has been shown to improve following rotator cuff repair. In fact, the authors showed that in all but one patient, muscle degeneration remained the same or progressed. This degenerative progression was positively correlated to preoperative muscle degeneration. Further clinical research is necessary to evaluate the progression of muscle degeneration as a function of rehabilitation timing.

Biomechanical factors also guide the decision-making process in rehabilitation timing. Early motion could damage the repair integrity due to cyclic loading at a time when healing tissue is not capable of withstanding such loads, and early motion could induce fatigue loading of the suture repair. Both of these phenomena could lead to undesired gap formation at the repair site. Some studies have attempted to quantify the in vivo loads of the intact rotator cuff tendons. Supraspinatus forces range from 43 to 350 N and infraspinatus forces range from 55 to 900 N depending on shoulder position and motion.[31-34] Cadaver biomechanics studies assessing so-called time-zero strength of rotator cuff repair indicate that ultimate loads of supraspinatus tendon repairs exceed 250 to 350 N,[16,35,36] demonstrating that ultimate strength is restored to approximately 70% to 100% of native loading requirements. Cyclic loading is arguably the more clinically relevant loading scenario, however, and biomechanical studies demonstrate that even double-row repairs exhibit some repair gapping after cyclic loading.[16,35,36] Thus, immobilization is thought to reduce the re-tear rate by decreasing gapping at the repair site. Double-row repairs were introduced to alleviate concerns of early failure due to fatigue loading and/or gap formation[16,35,36] and to allow for earlier motion. Double-row repairs do not eliminate repair gapping, however, and clinical results between single- and double-row repairs are generally equivocal.[5,19,20]

These biologic and mechanical factors provide a framework for clinical recommendations with respect to postoperative rehabilitation. Within the clinical framework, however, there exists a spectrum of recommended activities and time points at which certain activities are allowed.

Most authors agree that a period of immobilization with a sling is beneficial during the early phase of recovery (ie, 4 to 6 weeks after repair).[23] Recommendations for activity level during this phase vary, however, with some advocating an early, more aggressive rehabilitation protocol and others a late, slower approach. These protocols recommend passive ROM under the supervision or direction of a physical therapist or physician and/or the consistent use of a continuous passive motion (CPM) device.[7] Late, slow protocols generally limit early motion by allowing only limited passive ROM and do not encourage either active participation in formal physical therapy or the use of a CPM device.[23,37] After this initial 6-week period, most protocols recommend beginning more aggressive passive and active ROM with proper progression of activity, culminating in sport- or work-specific endurance and strengthening activities.[21-23,38]

Postoperative Outcomes: Early Versus Late Rehabilitation

A summary of the current literature on postoperative rehabilitation timing appears in Table 1.

Functional Recovery (Outcome Measures)

Reconstruction of a functional rotator cuff is the ultimate goal of rotator cuff repair. Typically, functional level is quantified by patient-reported outcome measures that rate the patient's perceived shoulder function. Several outcome measures are commonly used in the rotator cuff literature, including the American Shoulder and Elbow Surgeons (ASES) score; the University of California, Los Angeles shoulder score; the Constant score; the Simple Shoulder Test (SST); and the Disabilities of the Arm, Shoulder, and Hand score.[45] Multiple studies have shown that these scores improve after rotator cuff repair regardless of repair technique.[5,19,46,47] However, functional outcomes as they relate specifically to postoperative rehabilitation are less widely documented.

A recent study reported better functional activity with an accelerated rehabilitation program.[41] Patients were randomized to receive either accelerated or slow rehabilitation. The accelerated group began active ROM 3 weeks postoperatively, whereas the slow group began active motion 6 weeks postoperatively. Using the Disabilities of the Arm, Shoulder, and Hand questionnaire, in which a score of zero indicates no disability and 100 indicates maximum disability, there was a significant difference between groups at 8-week follow-up (accelerated, 31.6; slow, 53.8) and 16-week follow-up (accelerated, 15.9; slow, 31.4). There was no significant difference be-

Table 1

Summary of the Current Literature on Rehabilitation Timing Following Rotator Cuff Repair and its Effects on Postoperative Outcomes

Study	No. of Pts	Average Age in Years	Tear Size	Degree of Tear	ROM Elevation (Early/Late)
Lee et al[7]	64	54.5 (group A), 55.2 (group B)[a]	Medium and large	Full-thickness	6 mo: group A, 157.3°; group B, 151.9°. 12 mo: group A, 155.3°; group B, 153°.
Kim et al[39]	105	60	Small and medium	Full-thickness	6 mo: 150.57°/147.14°. 12 mo: 159.75°/153.67°.
Cuff and Pupello[40]	68	63.2	U-shaped tears. Size not reported.	Full-thickness	6 mo: 172°/165°;[b] 12 mo: 174°/173°.
Düzgün et al[41]	29	55.9 (early), 56.6 (late)	Small, medium, and large	Partial and full-thickness	N/A
Garofalo et al[42]	100	60	N/A	N/A	6 mo: 158.1°/151.7°;[b] 12 mo: 165.2°/158°.
Deutsch et al[43]	70	57	Small, medium, large, and massive	N/A	No significant difference found
Parsons et al[44]	43	63.8	<3 cm and ≥3 cm	Full-thickness	Mean active FE at 12 mo: 166°/161°.[c]

ASES = American Shoulder and Elbow Surgeons; CPM = continuous passive motion; DASH = Disabilities of the Arm, Shoulder, and Hand; FE = forward elevation; FF = forward flexion; N/A = not applicable; ROM = range of motion; SST = simple shoulder test; UCLA = University of California, Los Angeles; VAS = visual analog scale

[a] Group A: aggressive early passive rehabilitation. Group B: limited early passive rehabilitation.

[b] Significant difference: $P < 0.05$

[c] Compared 10 stiff patients who had <100° FE or <30° external rotation with 33 non-stiff patients. Both groups wore a sling and did no rehabilitation for the first 6 weeks.

tween the groups at 24-week follow-up.

In a comparison of patients who were either immobilized in an abduction sling for 4 to 5 weeks or allowed passive ROM for the same period, Kim et al[39] found no significant difference between groups in ASES, Constant, or SST scores at 3-, 6-, or 12-month follow-up. A recent study also investigated SST and ASES scores in two groups of patients who were treated by two surgeons with different postoperative protocols.[48] The early group began pendulum exercises immediately and supervised home passive ROM at 5 to 7 days postoperatively. The delayed group began pendulum exercises after 7 days and passive ROM after 3 weeks. Both groups began active-assisted motion after 6 weeks. The delayed group had worse SST scores at 3, 6, 9, and 12 weeks as well as significantly worse ASES scores at final follow-up.

Cuff and Pupello[40] performed a prospective randomized investigation of early and delayed ROM following arthroscopic rotator cuff repair. Both groups wore a shoulder immobilizer and performed pendulum exercises when not at therapy. The early group participated in formal physical therapy consisting of passive elevation and external rotation three times per week for the first 6 weeks, and the delayed group followed the same protocol beginning at 6 weeks. At 1 year postoperatively, there were no differences in ASES scores (early, 91.1; delayed, 92.8) or SST scores (11.1 for both groups).

Lee et al[7] compared aggressive and limited protocols that differed mainly in the amount of passive ROM allowed. The limited group was held to <90° elevation and no external rotation, and the aggressive group had no such limit during the first 3 weeks. A significant difference

Table 1 (continued)

Summary of the Current Literature on Rehabilitation Timing Following Rotator Cuff Repair and its Effects on Postoperative Outcomes

Functional Outcome Measure (Early/Late)	Mean VAS (Early/Late)	Re-tear Rate (Early/Late)	Recommendation
UCLA score at 3 mo: group A, 29.4; group B, 26.5. UCLA score at 24 mo: group A, 32.3; group B, 31.8.	No significant difference at 3, 6, or 12 mo	Group A, 23.3%. Group B, 8.8%. *P* = 0.106.	Limited self-directed rehabilitation best. More aggressive rehabilitation increases the re-tear rate.
Constant score at 6 mo: 66.11/64.52; at 12 mo: 69.81/69.83. ASES score at 6 mo: 67.08/69.89; at 12 mo: 73.29/82.90.	6 mo: 3.0/3.2; 12 mo: 2.8/1.8	12%/18% (*P* = 0.429)	Beginning early passive ROM <4 wk postoperatively had no effect
SST score at 12 mo: 11.1/11.1. ASES score at 12 mo: 91.1/92.8.	N/A	15%/9% (*P* = 0.47)	Slight improvement in early ROM but very similar outcomes at 1 y. Slightly better healing observed in the delayed ROM group.
DASH score at 8 wk, 31.6/53.8;[b] at 16 wk, 15.9/31.4.[b]	5 wk: 2.32/4.67;[b] 16 wk: 0.32/2.86.[b]	N/A	Accelerated protocol led to less pain and more rapid recovery of functional level
N/A	2.5 mo: 7.5/9.1;[b] 6 mo: 0.5/0.6; 12 mo: 0.2/0.2.	N/A	CPM reduces joint pain and improves ROM at short-term follow-up
N/A	N/A	19%/9% (*P* > 0.05)	At 6 mo, decelerated protocol (beginning passive FF at 4 wk) resulted in fewer re-tears
Constant score: preoperative, 46 stiff vs 54 non-stiff; 12 mo, 77 stiff vs 74 non-stiff. ASES score: preoperative, 45 stiff vs 47 non-stiff; 12 mo, 83 stiff vs 79 non-stiff.	Preoperative: 5.8 stiff vs 5.1 non-stiff. 12 mo: 2.0 stiff vs 1.7 non-stiff.	Stiff: 30%. Non-stiff: 64%. *P* = 0.079.	No significant difference in long-term outcome in patients who were stiff at 6 wk. Trend toward fewer re-tears in stiff patients.

ASES = American Shoulder and Elbow Surgeons; CPM = continuous passive motion; DASH = Disabilities of the Arm, Shoulder, and Hand; FE = forward elevation; FF = forward flexion; N/A = not applicable; ROM = range of motion; SST = simple shoulder test; UCLA = University of California, Los Angeles; VAS = visual analog scale

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[b] Significant difference: $P < 0.05$

[c] Compared 10 stiff patients who had <100° FE or <30° external rotation with 33 non-stiff patients. Both groups wore a sling and did no rehabilitation for the first 6 weeks.

was shown in the University of California, Los Angeles score at 3 months (aggressive, 29.4; limited, 26.5) but not at 6 or 12 months. Parsons et al[44] classified patients as stiff or non-stiff depending on their ability to obtain 100° of forward flexion or 30° of external rotation at 6 to 8 weeks postoperatively. At 1-year follow-up, they found no statistically significant difference in functional outcome between the two groups based on ASES and Constant scores.

These studies demonstrate a benefit with early ROM protocols at early follow-up, with equivocal results at longer follow-up.

Range of Motion

Several studies have reported on the effect of postoperative rehabilitation protocols on recovery of ROM after rotator cuff tear. Findings are mixed, however, with some authors documenting improvement in ROM and some showing more equivalent results.

In several studies, early use of a therapy protocol that incorporates CPM led to improvements in early ROM. Garofalo et al[42] compared two postoperative protocols used within the first 4 weeks after surgery (ie, early). Both groups performed passive ROM, but one group used a CPM device. There was a significant increase in ROM and pain relief in the CPM group at 2 to 3 months, but no differences in clinical outcomes were noted at 12 months.

In a recent study, early postoperative ROM was shown to be improved with a more aggressive postoperative regimen. Lee et al[7] compared two groups of patients with respect to ROM and several other outcomes. The two therapy protocols both began on the first postoperative day and differed only in the amount of passive motion allowed. Both groups began active-assisted motion at 6 weeks. The more aggressive group showed improved ROM at 3-month follow-up, but there was no difference at 6 or 12 months. Early motion was significantly better in the prospective randomized study by Cuff and Pupello,[40] as well. At 6-month follow-up, forward elevation was significantly better in the early group than in the late group (172° and 165°, respectively), but there was no difference at 1-year follow-up (174° and 173°, respectively), nor was there a difference in any internal or external rotation measurements. In their recent abstract on a two-surgeon experience with early and delayed protocols, Weber and Torrey[48] noted greater ROM in the early group at 3-, 6-, 9-, and 12-week follow-up.

Certain patient populations are at higher risk for postoperative stiffness following rotator cuff repair. Preoperative ROM has been noted to have a significant association with postoperative motion.[49] In one series, patients at higher risk for postoperative stiffness included those with calcific tendinitis, adhesive capsulitis, or partial articular-sided supraspinatus tendon avulsion tears; those undergoing concomitant labral repair; and those with single tendon cuff repairs.[37] A follow-up study on this at-risk population showed that modification of standard rehabilitation protocols done to include early closed-chain overhead stretching resulted in no cases of postoperative stiffness, which was a statistically significant improvement over historical controls (7.8%).[50]

Several other studies have shown no improvement in ROM with early motion protocols following rotator cuff repair. A recent study randomized patients into one of two groups based on when passive ROM was allowed after arthroscopic rotator cuff repair.[39] Both groups wore an abduction sling for the first 6 weeks. The first group was encouraged to remove the sling during this time and perform passive ROM three to four times per day, whereas the second group was held in the sling at all times. After the initial 6 weeks, both groups began active-assisted motion. No significant difference in ROM was found at any follow-up time (3, 6, or 12 months). Parsons et al[44] reported on patients who were immobilized in a sling for the first 6 weeks after surgery. Patients were classified as stiff if they were unable to obtain 100° of forward elevation or 30° of external rotation passively. At 12 months postoperatively, there was no significant difference in ROM between stiff and non-stiff patients. Of note, there was a disparity in the surgical technique used for each group; 70% of the stiff patients were treated with double-row repair, compared with 27% of the non-stiff patients.

Several studies have shown equivocal long-term ROM outcomes in comparisons of more aggressive protocols and conservative rehabilitation programs. Studies with 12-month follow-up have consistently shown no significant difference in shoulder ROM due to early/aggressive rehabilitation even if a difference was noted at earlier follow-up.[7,39,42,44]

Pain

Garofalo et al[42] reported a lower average VAS pain score at 2.5-month follow-up in the group that used a CPM device in the early rehabilitation phase (CPM, 7.5; non-CPM, 9.1). Düzgün et al[41] reported on pain at rest, during activity, and at night. At 5-week follow-up, there was a significant difference in VAS between the accelerated and the slow protocol during activity and at night. There was no difference in VAS at rest or at any of the other follow-up times (1 week and 3, 8, 12, 16, and 24 weeks). Weber and Torrey[48] also reported worse VAS in the delayed group at all follow-up times (final follow-up, 12 weeks).

In their study comparing early passive motion with immobilization following rotator cuff repair, Kim et al[39] did not find any significant difference in VAS pain scores between the groups at either 6 or 12 months. They did not report pain scores at the 3-month follow-up. In their study comparing aggressive and limited postoperative protocols, Lee et al[7] found no statistically significant difference in pain scores between groups at 3-, 6-, or 12-month follow-up.

Pain is a subjective outcome measure. Although the aforementioned studies may lend some support to the notion that allowing more early ROM could decrease pain, they do not definitively support that hypothesis. Further research is needed on pain in the early postoperative period.

Muscle Strength

Standard rehabilitation protocols do not focus on recovery of strength until adequate early tendon-to-bone healing has occurred and glenohumeral ROM has recovered.[23] Several studies have reported on strength in the shoulder after rotator cuff repair in patients who followed a so-called routine rehabilitation protocol.[51,52] In a recent study, Hughes et al[51] demonstrated that rotator cuff strength, as characterized by dynamometer testing, was lower at 3 months postoperatively compared with preoperative strength and did not improve to higher-than-preoperative levels until 6 months postoperatively.

Bey et al[52] reported that even 24 months postoperatively, shoulder strength remained less than that of the contralateral healthy shoulder in most patients. They noted less abduction and elevation strength in more than half of patients and less external rotation strength in 81%. They also noted that these surgeries were on the dominant shoulder in 71% of cases; thus, the nondominant shoulder was frequently stronger postoperatively. In their study comparing aggressive passive ROM and limited passive ROM, Lee et al[7] found a nonsignificant trend toward improved strength in the more conservative group at 3-month follow-up and no difference between the groups at 12-month follow-up.

Further research is needed on recovery of strength with respect to various rehabilitation protocols following arthroscopic rotator cuff repair.

Re-tear Rates

Re-tear of the rotator cuff following repair remains a considerable concern to surgeons and patients alike. A recent systematic review found the overall re-tear rate after arthroscopic repair to be 20.4%.[53] The reported re-tear rate varies widely, ranging from zero to 94%.[14,54-57]

The risk of recurrent tear varies by patient population; thus, the frequency of re-tear in a given study must be considered in the context of the individual study population and the study design. Furthermore, methodology regarding the characterization and definition of re-tears is inconsistent. The re-tear rate is related to patient factors such as age, tear size, tissue quality, fatty infiltration, and medical comorbidities, as well as to surgical technique, such as arthroscopic or open repair, and single- or double-row repair.[3,9,14] However, the effect of specific postoperative rehabilitation protocols on re-tear rates has not been as well studied. One concern of both patients and health-care professionals is that an early, aggressive rehabilitation program may be associated with a higher incidence of tendon re-tear.

In a prospective randomized study, Deutsch et al[43] evaluated re-tear following different postoperative rehabilitation techniques. Both patient groups performed pendulum exercises and passive external rotation stretching in the early postoperative period, beginning passive ROM either on postoperative day 7 (standard group) or after 4 weeks (decelerated group). Patients were evaluated clinically and with rotator cuff ultrasound. At 6 months, the re-tear rate was 19% in the standard treatment group and 9% in the decelerated group. This difference was not statistically significant.

In a randomized study, Cuff and Pupello[40] used ultrasonography to evaluate rotator cuff healing an average of 12.2 months after surgery. The re-tear rate was slightly higher in the early ROM group than in the delayed ROM group (15% and 9%, respectively). This difference was not statistically significant. Lee et al[7] evaluated re-tear rates on postoperative MRI ≥6 months after repair in their study on aggressive versus conservative rehabilitation. Although the re-tear rate was significantly higher in the more aggressive group than in the conservative group (23.3% and 8.8%, respectively), there was no difference in long-term functional outcome. Kim et al[39] reported on re-tear rates after cuff repair in a prospective study comparing different passive motion regimens in the early postoperative period. MRI and CT arthrography were used to diagnose re-tears at a minimum of 12 months postoperatively. The re-tear rate was 12% in the early ROM group and 18% in the other group. This difference was not statistically significant. Weber and Torrey[48] also used MRI after 4 to 6 months to evaluate the re-tear rate in patients who had early or delayed rehabilitation. The delayed group exhibited more defects on follow-up MRI. This was not statistically significant, however. Parsons et al[44] reported a trend toward lower re-tear rates in stiff patients than in non-stiff patients (30% and 64%, respectively) at 12-month MRI evaluation. This difference was not significant, which likely is attributable to the low sample size of the study.

These results with respect to re-tear of the rotator cuff should be analyzed critically. Three of the aforementioned five recent studies that compare different rehabilitation protocols after arthroscopic rotator cuff repairs found a trend toward higher re-tear rates with an early/more aggressive therapy protocol.[7,40,43] The re-tear rates were not statistically different in any of these three studies. The other two studies had a higher but not statistically significant re-tear rate in patients treated with a more conservative protocol.[39,48]

None of these studies reported a difference in functional outcomes scores at final follow-up (12 to 24 months), regardless of the state of the rotator cuff tendon. The heterogeneous designs and methods of these studies preclude any type of data aggregation to improve the power of the data, however. Although the literature suggests that patients with intact repairs have excellent clinical outcomes, the significance of postoperative rotator cuff tears is not clear. Because of the lack of postoperative tear size stratification and insufficient statistical power to perform such stratification in most studies, it cannot be definitely concluded whether rehabilitation timing has an effect on re-tear incidence. Future research is needed to assess the effect of timing on the incidence of re-tears.

Summary

The literature does not definitively demonstrate a significant clinical difference between more aggressive, early rehabilitation regimens compared with slower programs that rely on a longer period of immobilization. However, a trend has been observed toward better early pain relief, ROM, and functional scores in patients treated with an early/aggressive program. However, higher re-tear rates have been noted, as well, with such regimens. In general, these differences are observed in the early stages of healing, and a consensus exists that rehabilitation timing does not affect clinical outcomes after 6 to 24 months postoperatively. Long-term follow-up studies (>24 months) are necessary to elucidate whether re-tears affect outcomes.

The lack of a consensus in the literature suggests the need for more focused research. The effect of rehabilitation timing on clinical outcomes as a function of patient factors such as age, sex, body mass index, compliance level, and concomitant conditions have yet to be fully elucidated. Large studies such as prospective cohorts originating from registry-based data will provide clinically helpful information by stratifying patients into subgroups, and some of these patients may benefit from aggressive rehabilitation. Currently, treatment should be individualized, taking into account factors such as perceived compliance, tear chronicity, tissue/repair integrity, patient age, and mechanism of injury.

References

Evidence-based Medicine: Levels of evidence are described in the table of contents. In this article, references 5, 20, 39, and 40 are level I studies. References 7, 8, 19, 30, 42, and 46 are level II studies. References 2, 9, 12, 14, and 41 are level III studies. References 3, 6, 37, 44, 47, and 50-57 are level IV studies.

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