

Proper Postoperative Rehabilitation after Rotator Cuff Repair

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Abstract

The incidence of rotator cuff tears is increasing rapidly due to the aging of the population and the advancement of radiological diagnosis. Moreover, arthroscopic rotator cuff repair is the most widely performed orthopedic surgery, and the surgical outcome is comparable to open rotator cuff repair. Arthroscopic repair is one of the minimally invasive procedures itself and may have additional benefits of postoperative pain reduction and early functional recovery. Recently, there has been increasing interest in various methods for improving the functional recovery of patients after arthroscopic shoulder surgery. Various phases of functional recovery after arthroscopic shoulder surgery are classified by the postoperative period, and they are being studied actively and improved at each stage. However, there is a range of methods according to the postoperative period, rehabilitation stage, characteristics of individual patients, tear size of a rotator cuff, and underlying disease of patients. Therefore, it is essential to establish proper regimens for proper postoperative rehabilitation for functional recovery after arthroscopic rotator cuff repair.

Key Words: postoperative rehabilitation; rotator cuff repair

Introduction

Rotator cuff repair is one of the most successful treatment options in orthopedic surgeons, and most patients enjoy functional recovery after the procedure. Nonetheless, the nonhealing rate after rotator cuff repair remains at 20% to 90% despite the great advances in postoperative management. Arthroscopic repair is one of the minimally invasive procedures itself and may have additional benefits of postoperative pain reduction and early functional recovery. Recently, increased emphasis has been placed on post-operative influences of rehabilitation techniques on healing.

As far as our knowledge, the benefits of early passive motion after rotator cuff repair remain unproved, and very few reports are published in the literature regarding postoperative rehabilitation after rotator cuff surgery. Furthermore, no well-designed clinical trial investigates the efficacy of early passive motion exercise on the postoperative stiffness, functional outcome, and failure rate of cuff healing. Therefore, we designed this prospective, randomized comparative trial to verify whether early passive motion exercise affects functional and anatomic outcomes after arthroscopic repair in patients with small to medium-sized rotator cuff tears.

A healed rotator cuff repair results in a superior outcome for the patient compared with a non-healed repair. The surgeon can maximize the chance of a healed repair by knowing the end-point of each key step in the repair process and adhering to a few core principles. First, the rotator cuff tear pattern (e.g. crescent, L-tear, reverse L-tear, U-tear) must be recognized,

starting with careful assessment of preoperative MRI but concluding with the arthroscopic assessment of tear edge mobility. Second, a low-tension, anatomic, and mechanically robust repair construct (e.g. linked, double row; load-sharing ripstop; margin convergence to bone) must be determined based on the tear pattern. Increasingly, surgeons are recognizing the importance of the superior capsule of the shoulder, which can appear as a separate pathoanatomic structure in a delaminated rotator cuff tear and require independent suturing in the repair construct. Third, the biological healing capacity of the repair site must be optimized by using meticulous preparation of the greater tuberosity bone, including removal of soft tissue remnants, light burring, and creation of bone vents. Finally, avoid aggressive early rehabilitation after arthroscopic rotator cuff repair respecting that tendon to bone healing is unlikely to occur before 12 weeks postoperatively. Sling immobilization and judicious use of early passive motion should be used for the first 6 weeks, with passive shoulder range of motion performed during weeks 6-12 postoperatively. Rotator cuff strengthening and active overhead use of the arm should be delayed until at least 12 weeks after surgery to minimize the risk of cuff retear.

The timing of postoperative initial rehabilitation for rotator cuff repair

Early passive range of motion (ROM) following arthroscopic cuff repair is thought to decrease postoperative stiffness and improve functionality. However, early aggressive rehabilitation may compromise repair

integrity. Our purpose was to perform a systematic review to determine if there are differences between early and delayed rehabilitation after arthroscopic rotator cuff repair in terms of clinical outcomes and healing. Early rehabilitation after arthroscopic cuff repair is associated with some initial improvements in ROM and function. Ultimately, similar clinical and anatomical outcomes between groups existed at 1 year. While there was no significant difference between groups in anatomic failure of the repaired cuff, there may be a trend towards increased re-tear with larger tears. In the shoulder, joint, early passive motion is also the standard rehabilitation protocol after rotator cuff repair to avoid postoperative stiffness, especially in the era of open or mini-open surgery, and Raab et al suggested in their prospective randomized study that early continuous passive motion after rotator cuff repair has a beneficial effect on a range of motion (ROM) and pain relief. Recently, however, some authors suggested that early motion after rotator cuff repair could negatively affect cuff healing, and their reports showed that anatomic outcomes were rather disappointing with high non-healed rates, even with the use of the new technique to maximize cuff healing. Therefore, with each decision, the rehabilitation clinician should weigh the stresses each intervention places on the rotator cuff relative to its potential value balanced against the implications for healing

The phase of functional recovery after rotator cuff repair

Phase 1: Postoperative 1-6 weeks

Passive range of motion exercise can be performed from immediately after surgery to 4-6 weeks after surgery, and manual joint exercise at this time is passive joint range exercise by CPM or physical therapist. Manual joint exercise varies widely from early implementation to minimize the limitation of the range of joint motion after surgery to delayed manual joint exercise considering the time required for healing the case after rotator cuff surgery. In the former case, manual joint motion after arthroscopic rotator cuff suture due to rotator cuff tear is of paramount importance in early rehabilitation treatment to restore shoulder joint function.

Many studies have reported that early manual joint exercise using persistent manual exercise devices improves the range of joint exercise. Garofalo et al. reported that both groups performed manual joint exercises within the first 4 weeks of surgery, of which one group used persistent manual exercise devices, statistically significantly increased the range of joint movements and alleviated pain. Recent Lee et al. did not actively perform early manual joint exercises after surgery.

When comparing, it was observed that the range of joint motion improved for 3 months after surgery in the group that performed manual joint exercise more actively, but there was no significant difference for 6 months after surgery and 1 year after surgery. A prospective study by Cuff and Pupello found that the forward flexion range of the shoulder joint was relatively improved to 172 degrees in the case of early manual joint movement and 165 degrees in the case of delayed manual joint movement. Kim et al. also reported that early manual joint motion performed after arthroscopic rotator cuff suture did not improve the range of joint motion or relieve pain after surgery, but that did not negatively affect the healing of rotator cuff tendon. This study suggests that early manual joint exercise is not mandatory after surgery, and the timing of postoperative rehabilitation may vary depending on the characteristics of the patient. Patients aged 60 or older develop more postoperative stiffness, and since aging is one of the important risk factors for postoperative stiffness, early manual joint exercise needs to be considered during rehabilitation. In addition, it is thought that the range of joint motion before surgery is closely related to the range of joint motion after surgery. In recent years, arthroscopic capsular release and non-invasive joint manual surgery are performed together with arthroscopic rotator cuff repair, and this simultaneous surgery does not affect the clinical results of rotator cuff repair. However, calcific tendinitis, adhesive capsulitis, or partial rotator cuff tear, are generally patients with a high possibility of stiffness after

arthroscopic rotator cuff repair. As shown above, to achieve both the purpose of delay in functional recovery due to stiffness after surgery and rotator cuff repair, we think that the appropriate start time of manual joint movement should be determined according to the patient's situation. In other words, patients with a large size tear or larger are relatively more likely to not the rotator cuff repair after surgery, so delay healing after repairing the rotator cuff may be a more important goal for them. Therefore, early manual joint range recovery exercise is performed even at the risk of certain stiffness after surgery.

However, it is recommended that patients with relatively high success rates, such as patients with diabetes, patients with calcific tendinitis, and patients with preoperative adhesive capsulitis or PASTA lesions, should selectively perform early manual joint exercises.

Phase 2: Postoperative 6-12 weeks

This phase usually performs an active auxiliary range of motion exercise (AROM exercise) using a bar. About 12 weeks after rotator cuff surgery, most patients aim to obtain a perfect range of manual joint motion without accompanying pain. In the case of an active range of motion exercise (AROM exercise), it is possible to raise forward at least 120 degrees and is light below shoulder height without any special difficulty or pain.

We should be able to perform non-repetitive daily life or tasks. To this end, continuous patient education is conducted so that more strengthened manual joint exercise and AROM exercise or AROM exercise can be implemented at this time. This phase usually begins with active axillary joint exercise using a bar. From the end of the adjuvant fixation period, repeat the rod exercise three times a day for five weeks, 10 times a day.

Phase 3: Postoperative 12 weeks

The exercise goal of this stage is muscle-strengthening exercise, which is recommended to start when the patient's pain level is less than 2 points of VAS and when sufficient manual joint exercise range (about 80% or more of normal) is obtained. Previous studies on animals reported that about 12 weeks after rotator cuff suture, the degree of adhesion to the tendon adhesion of the tendon was 29%-50% of the normal strength and almost completely reattached at the 15th week. Of course, the patient's rotator cuff may be slow to attach to the tendon of the upper arm bone depending on the patient's poor condition or the presence or absence of an accompanying disease, but in general, the tendon attachment of the tendon is sufficient 20 weeks after surgery. Of course, muscle strengthening should never be done unreasonably in patients who have not yet obtained a sufficient range of joint motion or who are still in severe pain, which increases pain and increases the risk of failure to attach the tendon. Therefore, the muscle strength strengthening exercise at this stage should be applied only when the patient has sufficiently recovered the range of manual joint exercise, and it is important to perform it according to the individual level in consideration of the patient's characteristics and condition. Muscle performance strategies should begin with AROM exercises with the upper extremity in a short-lever or gravity-minimized position with a $\leq 15\%$ supraspinatus EMG activity level, followed by progressive stresses with a longer lever or higher loads. Usually, 12 weeks after surgery, ultrasound is used to confirm adhesion to the tendon of the upper arm bone of the tendon, and muscle strengthening exercises are performed after obtaining sufficient range of joint and upper arm joint motion of the shoulder joint. For most patients, this stage can be said to be the last stage of functional recovery therapy after arthroscopic rotator cuff surgery. If the joint range is not satisfactory to enter the muscle strength strengthening exercise, it is necessary to actively perform additional joint range recovery exercises. The goal is to recover more than 80% of the normal range of operation and proceed with muscle strength strengthening exercises, but it is better to remind that it is a joint range recovery exercise that should be habituated in the long run.

Restore normal arthrokinematics

Adding periscapular excise to the muscles around the scapula rather than just stretching and muscle strengthening exercises can increase the muscle strength of the muscles around the scapula and prevent scapular dyskinesia in the future. Therefore, the author divides functional recovery exercises for muscles around the shoulder blades into posture correction exercises, stretching exercises, and muscle exercises in the following ways.

Conclusion

Postoperative rehabilitation of rotator cuff repair

As the prevalence of rotator cuff tear increases due to the aging population and the increase in sports activities, rotator cuff using arthroscopy is increasing. Therefore, in proportion to this, the functional recovery treatment after shoulder arthroscopy surgery is attracting more and more attention and interest is increasing. As doctors and patients recognize that preoperative pain control and muscle strengthening exercises suitable for each postoperative period are as important as arthroscopic repair for rotator cuff tears are as important for postoperative joint function recovery. However, it is difficult to specify the postoperative function recovery treatment method as the timing and method of application of function recovery treatment may vary depending on the characteristics of underlying diseases and rotator cuffs of patients, such as diabetes, calcific tendinitis, or PASTA lesions. The postoperative functional recovery treatment period is the most important in promoting the re-adhesion of ruptured plexus and preventing postoperative stiffness. This functional recovery treatment method should be individualized in consideration of the compliance with the treatment of individual patients with various characteristics, the degree of reattachment to the humerus after suture of a rotator cuff tear, patient age, and injury mechanism. It can be said that it is the best method if a clear criterion is established in consideration of the characteristics of each patient at each time and stage after surgery, and the effectiveness of this functional recovery treatment can promote successful suture of rotator cuffs.

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