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Delayed versus early motion after arthroscopic rotator cuff repair: a meta-analysis

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Background: We conducted a meta-analysis of randomized trials to compare delayed vs early motion therapy on function after arthroscopic rotator cuff repair.
Methods: We searched 4 electronic databases (Medline, Embase, Cochrane, and Physiotherapy Evidence Database [PEDro]). The methodologic quality of the included studies was assessed, and the relevant data were extracted. Data were pooled for functional outcomes, rotator cuff tear recurrence, and shoulder range of motion. Complications were reported descriptively.
Results: Three level I and 1 level II randomized trials were eligible and included. Pooled analysis revealed no statistically significant differences in American Shoulder and Elbow Surgeons scores between delayed vs early motion rehabilitation (mean difference [MD], 1.4; 95% confidence interval [CI], −1.8 to 4.7; $P = .38$, $I^2 = 34\%$). The risk of retears after surgery did not differ statistically between treatment groups (risk ratio, 1.01; 95% CI, 0.63–1.64; $P = .95$). Early passive motion led to a statistically significant, although clinically unimportant, improvement in forward elevation between groups (MD, −1°; 95% CI, −2° to 0°; $P = 0.04$, $I^2 = 0\%$). There was no difference in external rotation between treatment groups (MD, 1°; 95% CI, −2° to 4°; $P = 0.63$, $I^2 = 0\%$). None of the included studies identified any cases of postoperative shoulder stiffness.
Conclusions: The current meta-analysis did not identify any significant differences in functional outcomes and relative risks of recurrent tears between delayed and early motion in patients undergoing arthroscopic rotator cuff repairs. A statistically significant difference in forward elevation range of motion was identified; however, this difference is likely clinically unimportant.
Level of evidence: Level II, Meta-analysis.

Keywords: Rotator cuff; therapy; motion; rehabilitation; shoulder

Rotator cuff tears are a common cause of shoulder pain and disability.[33] The goals of rotator cuff repair are to relieve pain, reduce functional disability, and achieve tendon-to-bone healing. Although surgical technique is important, the postoperative rehabilitation protocol is also

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an integral contributor to favorable outcomes. However, the optimal duration of shoulder immobilization after surgery is the subject of ongoing debate. Proponents of early motion stress the importance of decreasing the incidence of postoperative shoulder stiffness, which is a common complication after rotator cuff repairs[8,35]; yet, others contend that longer periods of immobilization may not increase the rate of stiffness.[29] Animal studies also suggest that delayed motion may reduce tension on the repair site and decrease the subsequent risks of retears as well as improve the structural, compositional, and biomechanical properties of the repaired cuffs.[11,34]

Previous systematic reviews that have addressed the issue of timing of rehabilitation[3,8,35] did not focus exclusively on the highest available evidence and lacked a priori definitions of the rehabilitations of interest. Furthermore, recent randomized trials have evaluated the optimal duration of immobilization after surgery. Thus, the current systematic review and meta-analysis aims to compare the outcomes between delayed-motion vs early-mobilization rehabilitation in patients undergoing arthroscopic rotator cuff repairs using data from only randomized clinical trials. We hypothesize that there would be no difference in outcomes between the two forms of therapy.

Materials and methods

Search strategy

In consultation with a librarian, an electronic search of 4 databases was conducted: Medline (1946 to January 2013), Embase (1974 to January 2013), the Cochrane Central Register of Controlled Trials (up to January 2013), and Physiotherapy Evidence Database (PEDro; entire database up until last update on January 2, 2013). A comprehensive search strategy using keywords and medical subject headings was performed (see Appendix 1). In addition, a search for ongoing studies from www.clinicaltrials.gov was done. Meeting proceedings between 2008 and 2012 were also searched from the American Academy of Orthopedic Surgeons (AAOS), American Shoulder and Elbow Surgeons (ASES), and Arthroscopy Association of North America (AANA). In the event that a study in abstract form was potentially eligible for inclusion, the authors were contacted for a complete manuscript or data confirmation. If this could not be obtained, the study was excluded. Finally, the references of all included studies were hand searched for additional citations.

Inclusion criteria

Types of studies

Randomized or quasi-randomized controlled trials comparing delayed vs early shoulder mobilization were included. Studies reported in any language were eligible for inclusion.

Types of participants

Studies with patients aged 18 years or older who had undergone an arthroscopic repair of a full-thickness tear of at least 1 rotator cuff tendon were included.

Types of interventions

The delayed group required at least 4 weeks of shoulder immobilization, but shoulder pendulum exercises were permitted during this period. Early mobilization was defined as passive shoulder range of motion exercises beginning within the first 2 weeks after cuff repair surgery.

Types of outcome measures

The primary outcome of interest was functional scores from the validated ASES scale. The secondary outcomes of interest were other commonly used validated functional outcomes, including the Constant-Murley scale (CMS), Simple Shoulder Test (SST), Western Ontario Rotator Cuff (WORC) index, and Disabilities of the Arm, Shoulder, and Hand (DASH). Additional outcomes of interest were the proportion of rotator cuff tendons that had recurrent full-thickness tears, assessed radiographically after a minimum of 6 months of follow-up. Data were also collected on shoulder range of motion, particularly active forward elevation and external rotation, and complications. Outcome data from eligible studies were extracted from the latest time point in all trials.

Study selection

Two authors (K.C. and D.J.H.) independently reviewed all citations generated from the literature search. Inconsistencies were resolved by discussion and consensus. If a consensus could not be reached, a final decision on study inclusion was made by the senior author (G.S.A.). The degree of agreement was measured using the κ statistic. We considered κ values from 0.40 to 0.59 as fair agreement, 0.60 to 0.74 as good agreement, and 0.75 or more as excellent agreement.[20]

Data collection and management

Two reviewers (K.C. and D.J.H.) independently extracted the outcomes of interest from the included studies. Disagreements in data were resolved by discussion and cross-referencing with the original study. When necessary, we contacted original investigators for data verification.

Data analysis

Where possible, a pooled risk ratio (RR) was calculated for binary outcomes (ie, recurrent tendon tears identified on imaging), a mean difference (MD) was determined for continuous outcomes (ie, functional outcomes scores, range of motion), and 95% confidence intervals (CI) were determined for these estimates. Adverse events and complications were reported descriptively. The I^2 statistic was calculated to quantify the degree of heterogeneity, and the Cochrane χ^2 test was used to test for heterogeneity (significance set at $P < .10$). We considered $I^2 \leq 40\%$ to represent an acceptable degree of heterogeneity. Data were pooled using a random-effects model due to some degree of anticipated heterogeneity among the eligible studies.

If significant heterogeneity was present, then we planned to conduct subgroup analyses. Our prespecified subgroups were based on variables that were determined to be most important in the literature.[4,7,8,37] Specifically, heterogeneity would be explored by the following subgroups analyses: age (<60 and ≥60 years), tear