J Shoulder Elbow Surg (2018) 27, 572–576

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Journal of Shoulder and Elbow Surgery

www.elsevier.com/locate/ymse

Operative versus nonoperative treatment for the management of full-thickness rotator cuff tears: a systematic review and meta-analysis

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Background: Rotator cuff disease is the most common pathology of the shoulder, responsible for approximately 70% of clinic visits for shoulder pain. However, no consensus exists on the optimal treatment. The aim of this study was to analyze level I and II research comparing operative versus nonoperative management of full-thickness rotator cuff tears.

Methods: A literature search was performed, in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement, to identify level I and II studies comparing operative versus nonoperative treatment of rotator cuff tears. Two independent researchers reviewed a total of 1013 articles. Three studies qualified for inclusion. These included 269 patients with 1-year follow-up. The mean age ranged from 59 to 65 years. Clinical outcome measures included the Constant score and visual analog scale (VAS) score for pain. Meta-analysis, using both fixed- and random-effects models, was performed on pooled results to determine overall significance.

Results: Statistically significant differences favoring surgery were found in both Constant and VAS scores after 1 year, with mean differences of 5.64 (95% confidence interval, 2.06 to 9.21; $P = .002$) and −1.08 (95% confidence interval, −1.56 to −0.59; $P < .0001$), respectively.

Conclusion: There was a statistically significant improvement in outcomes for patients managed operatively compared with those managed nonoperatively. The differences in both Constant and VAS scores were small and did not meet the minimal difference considered clinically significant. Larger studies with longer follow-up are required to determine whether clinical differences between these treatments become evident over time.

Level of evidence: Level II; Meta-Analysis

Keywords: Rotator cuff tear; atraumatic tears; rotator cuff disease; operative treatment; nonoperative treatment; conservative management; rotator cuff repair; arthroscopy

Rotator cuff disease is the most common etiology of shoulder pain, responsible for up to 70% of all shoulder-related visits to physicians.[18,21] Rotator cuff tearing is present in 20% to 54% of persons aged between 60 and 80 years.[1,15]

This study was exempt from institutional review board review.

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https://doi.org/10.1016/j.jse.2017.09.032

Despite this wide prevalence, controversy exists over the optimal treatment. Physical therapy is widely used for atraumatic tears, and several studies have demonstrated its reliable and durable success.[6,11,25] Treatment with physical therapy does not result in healing of the torn rotator cuff, however, and natural history studies have raised concerns about tear progression and irreversible fatty infiltration worsening over time.[7,22,24]

Operative treatment is also a successful treatment option. The widespread use of arthroscopy has corresponded to a significant increase in rotator cuff repair procedures in recent decades.[4] Operatively treated patients return to work sooner and incur less cost burden when compared with patients treated nonoperatively.[17] Successful outcomes following rotator cuff repair do not diminish with midterm and long-term follow-up.[8]

Several randomized controlled trials have compared operative and nonoperative treatment of full-thickness rotator cuff tears; the results have been mixed. The aim of this study was to analyze level I and II comparisons of operative versus nonoperative management of atraumatic rotator cuff tears through meta-analysis.

Materials and methods

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement.[19] One independent reviewer systematically searched MEDLINE (via Ovid), PubMed (National Library of Medicine), Scopus (Elsevier, Amsterdam, Netherlands), and the Cochrane Controlled Trials Register (John Wiley & Sons, Hoboken, NJ, USA) from inception to October 2016. The database search was limited to level I and II studies, English-language studies, and human studies. The search strategy applied a combination of MeSH (Medical Subject Headings) and keyword searches using the following search terms: "rotator cuff injury"; "rotator cuff"; "rotator cuff tear"; "non traumatic tears"; "rotator cuff rupture"; "rotator cuff disease" and "surgical procedures, operative"; "general surgery"; "surgery"; "operative treatment"; "non operative treatment"; "conservative management"; "rotator cuff repair"; "orthopedic procedures"; "surgical procedures, operative"; "operative surgical procedures"; "impingement syndrome"; and "arthroscopy." The references of selected articles were also reviewed, when applicable, to identify additional studies.

Two independent reviewers (C.C.P. and A.J.H.) screened all articles eligible for inclusion. The inclusion criteria were as follows: randomized controlled trial, full-thickness rotator cuff tear, and age 18 years or old. The exclusion criteria included any history of rotator cuff surgery and a follow-up period of less than 1 year.

Meta-analyses were performed comparing outcomes after operative versus nonoperative treatment of rotator cuff tears. Differences in Constant scores and pain scores (as rated by a visual analog scale [VAS]) before and after intervention (surgery or physical therapy) were selected outcomes measured because they were included in all studies. Pooled mean differences were calculated using fixed- and random-effects models.[5] We tested the significance of heterogeneity between studies using the Q test and I^2 statistic.[3,13] Fixed-effects models were chosen if the Q test was not significant and I^2 was low (<20%). Otherwise, random-effects models were applied. Forest plots were used for presentation of the mean differences in outcomes and confidence intervals from individual studies along with the pooled mean difference and test for homogeneity.

Results

The initial database search yielded 1472 abstracts. After removal of duplicates, 1013 articles remained for review, of which 5 met the criteria for inclusion in the study. Of these 5 articles, 2 were excluded because they were follow-up studies on articles already chosen for review; these patient populations could not be considered separately from their original studies for statistical review purposes and were excluded (Fig. 1). Thus, 3 studies with a total of 269 patients with 1-year follow-up were included.[12,15,20] Patient demographic data and study characteristics are displayed in Table I. All studies had similar follow-up intervals and a minimum of 12 months' follow-up.

One study included 3 subgroups of patients for analysis, 1 of which underwent physical therapy and subacromial decompression without rotator cuff repair.[15] This cohort of patients (57 patients) was excluded. This same study used a subscale of the Constant score (scale of 0-15) to measure pain instead of a VAS (scale of 0-10). These pain scores were plotted on a graph from which no numerical data could accurately be extracted. This study was not included in the analysis of VAS scores. The Q test was not significant, and

Table I Study characteristics

	Kukkonen et al[15]	Moosmayer et al[20]	Heerspink et al[12]
Total patients	110*	103	56
Sex, n			
Men	50	73	35
Women	60	30	21
Treatment, n			
Nonoperative	55	51	31
Operative	55	52	25
Average age, yr	65	60	60
Follow-up, mo	3, 6, and 12	6 and 12	12

* One-third of patients (n = 57) received physical therapy and subacromial decompression without rotator cuff repair and were excluded from this study.