Surgical repair versus conservative management in degenerative rotator cuff tears: systematic review and meta-analysis

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ABSTRACT

Although surgery is generally used to treat acute traumatic rotator cuff tears (RCTs) in young patients, treating degenerative cuff tears remains a challenge for orthopedic surgeons, and no gold standard has been established. This work aims to determine the efficacy of surgical repair versus conservative management in shoulder degenerative RCTs patients. A systematic search was carried out over different medical databases to identify orthopedic surgery studies, which investigated the outcome of the surgical repair versus the conservative management of RCTs patients. We conducted a meta-analysis for the constant and visual analogue scale (VAS) scores as primary outcomes, and on retear (recurrence) rate as a secondary outcome. Seven studies were identified involving 628 patients: 314 in the surgical repair group and 314 in the conservative management group. Our meta-analysis process showed a non-significant difference in mean constant score and VAS score in the surgical repair group compared to the conservative management group (p > 0.05 for each). Also, we found that the overall pooled recurrence rate was 13.2%. This study compared the efficacy and safety of surgical repair versus conservative management in degenerative RCTs. According to our results, there was no difference between both groups in their effect on mean constant score and mean VAS score, also retear after surgical repair may occur at a similar rate. This means that both approaches had a similar efficacy.

Keywords: Surgical repair, conservative, degenerative rotator cuff tears.

Introduction

Shoulder problems are frequently caused by rotator cuff injuries. In the United States, 250,000 rotator cuff repairs are performed each year, yet there is still debate over the best way to treat these tears [1]. The socioeconomic costs of rotator cuff tears (RCTs) are growing, especially in terms of loss of quality of life, loss of working days, and public healthcare expenses, as the retirement age rises and people over 60 become more healthy and active [2]. Individual anatomical features, such as the inclination of the glenoid and the lateral extension of the acromion, have been shown to influence the development of RCTs [3]. Sayampanathan et al. [4] reviewed the most significant risk factors for RCTs in a meta-analysis published in 2017. They reported that age above 60 years and hand dominance is the most relevant risk factors for RCTs. Risk factors also included BMI, female gender, tobacco smoking, hypertension, and diabetes.

Although surgery is generally used to treat acute traumatic RCTs in young patients, treating degenerative cuff tears remains a challenge for orthopedic surgeons, and no gold standard has been established [5]. Non-surgical RCTs management is frequently recommended for patients with partial thickness or small full thickness tears, especially in subjects with lower functional demands. However,
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Surgical management is preferred for active patients with high functional demands [6]. Rest, non-steroidal anti-inflammatory drug (NSAIDs), corticosteroid injections, and physical therapy are usually used as conservative treatments, while arthroscopic repair is virtually always used as an operative treatment [6]. Several studies have found that both conservative therapy and surgical correction enhance clinical and functional outcomes in people with this condition [7,8]. Nevertheless, not only is the superiority of operational versus non-operative management debatable, but the factors that may influence the therapeutic outcome are also unknown [9]. This work aimed to review and meta-analytically determine the efficacy and safety of surgical repair versus conservative management in degenerative RCTs patients.

Methods

Our review came following the (preferred reporting items for systematic reviews and meta-analyses) statement guidelines [10]. Basic searching was carried out using PubMed, Cochrane library, and Google Scholar utilizing the following keywords: surgical repair, conservative, degenerative, and RCTs. RCTs, clinical trials, and comparative studies, which investigated the outcome of the surgical repair group versus the conservative management group of patients of degenerative RCTs, which will be reviewed.

Outcome measures included constant and visual analogue scale (VAS) scores as primary outcomes, and the retear (recurrence) rate as a secondary outcome.

The included studies should be in English, a journal published article, and a human study describing degenerative RCTs patients. The excluded studies were either animal or non-English studies or articles describing shoulder dislocation patients.

We found 90 records; 30 excluded because of the title and 60 articles were searched for eligibility by full-text review. Out of the latter, 13 articles could be accessed, 22 studies were reviews and case reports, 11 were not describing functional outcome, and the desired procedure was not used in 7 studies. The studies which met all the inclusion criteria were 7 studies.

Statistical analysis

Pooled odds ratios, standard mean differences (SMDs), and proportions (%) with 95% confidence intervals (CI) were assessed, using the MedCalc statistical package (Belgium). The meta-analysis process was established via I² statistics (either the fixed-effects model or the random-effects model); according to the Q test for heterogeneity.

Results

Our meta-analysis included seven studies comparing two different groups of patients. The studies were published between 2010 and 2020. Regarding the type of included studies, all studies were RCTs. Regarding patients’ characteristics, the total number of patients in all the included studies was 628 patients: 314 in the surgical repair group and 314 in the conservative management group. Their average follow-up time was 36 months. The mean age of all patients was 63.5 years (Table 1).

The primary and the secondary outcome measures are presented in Table 2. Each outcome was measured by SMD for constant score and VAS score and by proportions (%) for recurrence rate. Concerning the primary outcome measures, we found six studies that reported constant scores.

F² (inconsistency) was 57.9% and Q test for heterogeneity showed a p = 0.036. Therefore, the random-effects model was carried out, with overall SMD = 0.0739 (95% CI = -0.18 to 0.33). The random-effects model of the meta-analysis process revealed a non-significant difference in mean constant score in the surgical repair group compared to the conservative management RCTs group (p >0.05; Figure 1).

We found four studies that reported VAS scores. F² (inconsistency) was 72.3% and Q test for heterogeneity was not used in 7 studies. The studies which met all the inclusion criteria were 7 studies.

Table 1. Patients and study characteristics arranged by the publication year.

<table>
<thead>
<tr>
<th>N</th>
<th>Author</th>
<th>Type of study</th>
<th>Total</th>
<th>Surgical repair group</th>
<th>Conservative management group</th>
<th>Average age (years)</th>
<th>Average follow-up time (months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Moosmayer et al.</td>
<td>RCT</td>
<td>102</td>
<td>51</td>
<td>51</td>
<td>60</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>Kukkonen et al.</td>
<td>RCT</td>
<td>110</td>
<td>55</td>
<td>55</td>
<td>65</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>Moosmayer et al.</td>
<td>RCT</td>
<td>102</td>
<td>51</td>
<td>51</td>
<td>65</td>
<td>60</td>
</tr>
<tr>
<td>4</td>
<td>Heerspink et al.</td>
<td>RCT</td>
<td>45</td>
<td>20</td>
<td>25</td>
<td>61</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>Kukkonen et al.</td>
<td>RCT</td>
<td>109</td>
<td>54</td>
<td>55</td>
<td>--</td>
<td>24</td>
</tr>
<tr>
<td>6</td>
<td>Moosmayer et al.</td>
<td>RCT</td>
<td>102</td>
<td>51</td>
<td>51</td>
<td>70</td>
<td>120</td>
</tr>
<tr>
<td>7</td>
<td>Ranebo et al.</td>
<td>RCT</td>
<td>58</td>
<td>32</td>
<td>26</td>
<td>60</td>
<td>12</td>
</tr>
</tbody>
</table>

RCT: Randomized controlled trial.

P-values were reported.
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**Table 2. Summary of the outcome measures in all studies.**

<table>
<thead>
<tr>
<th>N</th>
<th>Author</th>
<th>Primary outcomes</th>
<th>Secondary outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Constant score</td>
<td>VAS score</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surgical group</td>
<td>Conservative group</td>
</tr>
<tr>
<td>1</td>
<td>Moosmayer et al. [11]</td>
<td>76.8</td>
<td>66.8</td>
</tr>
<tr>
<td>2</td>
<td>Kukkonen et al. [12]</td>
<td>74.1</td>
<td>77.9</td>
</tr>
<tr>
<td>3</td>
<td>Moosmayer et al. [13]</td>
<td>79.3</td>
<td>77.7</td>
</tr>
<tr>
<td>4</td>
<td>Heerspink et al. [14]</td>
<td>81.9</td>
<td>79.7</td>
</tr>
<tr>
<td>5</td>
<td>Kukkonen et al. [15]</td>
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<td>80.6</td>
</tr>
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<td>6</td>
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<td>52.4</td>
<td>51.3</td>
</tr>
<tr>
<td>7</td>
<td>Ranebo et al. 2020 [17]</td>
<td>---</td>
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</tr>
</tbody>
</table>

VAS: Visual analogue scale.

**Figure 1. Forest plot (constant score).**

showed a $p = 0.012$. Therefore, random-effects model was carried out, with overall SMD = -0.296 (95% CI = -0.702 to 0.109). The random-effects model of the meta-analysis process revealed a non-significant difference in mean VAS score in the surgical repair group compared to the conservative management group ($p > 0.05$; Figure 2).

Concerning the secondary outcome measures, we found seven studies that reported the recurrence rates. $F$ (inconsistency) was 67.1% and $Q$ test for heterogeneity showed a $p = 0.005$. Therefore, random-effects model was carried out, with overall recurrence rate = 13.2% (Figure 3).

**Discussion**

This work determined the efficacy of surgical repair versus conservative management in degenerative RCTs patients. The included studies were published between 2010 and 2020. Regarding the type of included studies, all studies were RCTs. Regarding patients’ characteristics, the total number of patients in all the included studies was 628 patients: 314 in the surgical repair group and 314 in the conservative management group. Their average follow-up time was 36 months. The mean age of all patients was 63.5 years.

A meta-analysis included seven studies comparing the two different groups of patients for primary and secondary outcomes. Concerning the primary outcome measures, we found six studies that reported constant scores. The random-effects model of the meta-analysis process revealed a non-significant difference in mean constant score in the surgical repair group compared to the conservative management.
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Garibaldi et al. [6] reported that the difference between surgical and conservative management appears negligible at the 12 months' evaluation. While the meta-analysis showed statistically significant superior results in favor of surgical management, a real clinical impact could not be detected since the difference between treatments is inferior to the minimally clinical important difference in terms of both numerical rating scale for pain and constant score.

Longo et al. [19] reported that in terms of Constant-Murley score (CMS), meta-analysis gives the first comparison in the medium-term of follow-up. These results are consistent with those obtained during the short-term follow-up. CMS was insignificantly different.

Figure 2. Forest plot (VAS score).

Figure 3. Forest plot (recurrence rate).
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Comparing the surgical and conservative approaches. Itoi [18] reported that, at 12 months, CMS did not differ between the surgical and conservative treatments (mean = 81.9 vs. 73.7; \( p = 0.08 \)).

Concerning the primary outcome measures, we found four studies that reported VAS scores. The random-effects model of the meta-analysis process revealed a non-significant difference in mean VAS score in the surgical repair group compared to the conservative management group (\( p > 0.05 \)), which is in agreement with Kukkonen et al. [20] and Piper et al. [21]. Kukkonen et al. [20] reported that in a 1-year follow-up, there was no clinically meaningful difference between surgery and conservative treatments as measured by the constant score and pain VAS. Even though the pooled mean difference in constant score favored surgery, it was statistically and clinically insignificant. The combined analysis of three RCTs revealed that the surgical group had a statistically significant benefit in both constant and VAS scores as compared to the nonoperative cohort. However, both values were below the minimal clinically important differences of 10.4 and 1.4 for the constant and VAS scores, respectively [21].

On other hand, our result are in disagreement with Longo et al. [19] and Ramme et al. [22]. Longo et al. [19] showed that patients undergoing surgical repair had a better VAS pain at 1 year of follow-up. Ramme et al. [22] reported that the difference in Normalized Western Ontario Rotator Cuff Index (WORCnorm) score from baseline to end follow-up was 19.6 points (14.0, 28.9) comparing surgical repair and nonsurgical therapy groups. The change in the WORCnorm, American Shoulder and Elbow Surgeons score, Single Assessment Numerical Evaluation, and pain VAS levels differed considerably between the two groups favoring the surgical repair that resulted in higher improvement than nonoperative treatment.

Concerning the secondary outcome measures, we found seven studies that reported recurrence rates. \( F \) (inconsistency) was 67.1% and \( Q \) test for heterogeneity showed a \( p = 0.005 \). Accordingly, random-effects model was carried out that showed an overall recurrence rate of 13.2%, which is in agreement with Moosmayer et al. [23], Ranebo et al. [24], Sobhy et al. [25], and Kim et al. [26]. Moosmayer et al. [23] documented 10 patients (19%) who experienced retear during the first 12 months, with a little increase to 16 patients (29%) at the 10-year long-term review. Ranebo et al. [24] reported that rotator cuff tendons had just two re-injuries (6.25%) after 1 year of treatment. Sobhy et al. [25] reported a meta-analysis comparison of arthroscopic single-row (SR) with double-row (DR) rotator cuff repairs. They found that partial thickness retear rates after SR were substantially greater than after DR. The increased number of full thickness retears following SR, on the other hand, was not statistically significant. Kim et al. [26] reported that retear rates following larger-than-medium-sized tears were noted (more than the entire supraspinatus). In patients with remaining tendons less than 10 mm in length, the rate of retear was substantially higher with SB than with SR.

Conclusion

This study compared the efficacy and safety of surgical repair versus conservative management in degenerative shoulder RCTs repair utilizing the seven qualified studies. Our results revealed no difference between both groups in their effect on mean constant score and mean VAS score, and retear after surgical repair may occur.

List of Abbreviations

CI: Confidence interval
RCT: Randomized controlled trial
SMD: Standard mean difference

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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Consent to participate

Not applicable.

Ethical approval

Not applicable.

Authors’ contribution

All the listed authors contributed equally to the conception and design of study, acquisition, analysis, and interpretation of data, and drafting of the manuscript to justify authorship.

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