

RESEARCH ARTICLE

Open Access

SCIENTIFIC UPDATE ON THE THERAPEUTIC MANAGEMENT OF ROTATOR CUFF INJURIES: SYSTEMATIC REVIEW WITH META-ANALYSIS OF RANDOMIZED CLINICAL TRIALS

Matheus Pedroso Cavalcanti de Souza

Orthopedist and Traumatologist, Campina Grande Trauma Hospital, Campina Grande, PB., Brazil

Renan Toledo Curti

Orthopedist and Traumatologist, Santa Casa Ourinhos, Ourinhos, SP., Brazil

Bianca Gabriella de Oliveira

Medical student at Universidade Salvador-UNIFACS, Salvador, BA., Brazil

Abstract

To evaluate the effectiveness of operative and non-operative management in the treatment of rotator cuff injuries. Methodology: This systematic review was conducted according to Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. A search was conducted using the online Cochrane Library, EMBASE, CINAHL, Medline and PubMed databases, using the following terms: Rotator Cuff Injuries OR Rotator Cuff AND Orthopedic Procedures. Results: 688 patients were included, of whom 479 underwent surgical treatment and 209 non-operative treatment. The studies analyzed in this systematic review showed better results for the VAS (Visual analog scale), the Constant Murley Score and for limb range of motion in patients who underwent surgical treatment. Conclusion: Surgical treatment for rotator cuff injuries was associated with a better prognosis than physiotherapeutic treatment.

Keywords Rotator cuff injuries; Rotator cuff; Orthopedic procedures.

INTRODUCTION

The shoulder is a joint with an important functional role due to its extensive range of movement and flexibility. Due to excessive mechanical overload caused by ergonomics, overweight or muscle hypotrophy, rotator cuff injury is one of the most common degenerative lesions of the shoulder joint

and leads to a greater possibility of disability, with an increase in its prevalence in recent years.

This pathology is due to the anatomical importance of the four composing muscles: supraspinatus, infraspinatus, teres minor and subscapularis tendon, which establish stability in the

glenohumeral joint. The rotator cuff also plays an important role in the stability and function of the shoulder joint. Given its clinical relevance, there is currently much discussion about diagnostic and therapeutic management.

The scapulothoracic joint has a great connection with the glenohumeral joint due to the fact that it has no real articular anatomy; however, the combination of bones and scapular location result in participation in the biomechanics of the shoulder. The anteriorization of the scapula in the anteriorization of the thorax, head and neck due to a pain crisis can result in infrascapular stenosis and tendinopathy of the infrascapular rotator cuff.

In view of this, the literature points out that scapular muscle strength training, especially training of the rotator cuff muscles, generates better stability of the glenohumeral joint, expanding shoulder range of motion (ROM) and improving the healing effect of patients with rupture of the glenoid labrum of the scapula. The theory is that prolonged immobilization leads to fatigue of the serratus anterior muscle, causing a reduction in the degree of rotation and extension of the scapula and generating secondary injury due to impingement of the acromion and rupture of the rotator cuff.

The aim of this study is to compare the efficacy of conservative versus surgical treatment for rotator cuff injury, through a systematic review with meta-analysis of randomized clinical trials of the results before and after therapeutic intervention.

METHOD

This systematic review was conducted according to Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines.⁶

Search strategy

A search was conducted using the online Cochrane Library, EMBASE, CINAHL, Medline and PubMed databases, using the following terms: Rotator Cuff Injuries OR Rotator Cuff AND Orthopedic Procedures. The search was repeated using various alternative spellings for arthroereisis. No limitations were placed on gender, date or

language. All results up until 1 April 2024 were included. The SPICE strategy was used to identify the most relevant studies.

- Setting: patients diagnosed with rotator cuff injury.
- Perspective: individuals undergoing a non-surgical approach using orthoses for the treatment of rotator cuff injury.
- Intervention: Surgical treatment
- Comparison: patients undergoing treatment of rotator cuff injury through non-surgical treatment compared to the surgical group
- Evaluation: efficacy of non-surgical treatment

Inclusion and exclusion criteria

We included: (1) studies with patients with rotator cuff injury (2) studies addressing patients diagnosed with rotator cuff injury treated using non-operative and operative treatment (3) studies published between 2016-2024 (5) original studies, preferably randomized studies.

Exclusion: (1) studies evaluating surgical techniques for other shoulder injuries (2) studies published more than 15 years ago (3) non-original studies.

This systematic review has a positive registration with CRD42024530880,

RESULTS

After selecting 201 articles, 71 were excluded because they had been published for more than 15 years, leaving 130 to evaluate the titles and abstracts. Those that did not involve surgical or conservative treatment for rotator cuff injuries were eliminated. In this context, 44 articles were excluded, leaving 27 for full reading. Finally, 05 studies were selected for evaluation and preparation of this systematic review with meta-analysis (Figure 1).

The 05 articles selected presented patients diagnosed with rotator cuff injuries who underwent surgical or conservative treatment. 04 articles corresponded to arthroscopic intervention compared to motor physiotherapy to correct the

injury and 01 article evaluated only the clinical and functional efficacy of surgical treatment. A total of 688 patients were included, of whom 479 underwent surgical treatment and 209 non-operative treatment.

Table 1 shows the results obtained by the selected studies (Table 1).7,8,9,10,11

Table 2 shows the variation in the VAS (Visual Analg Scale) pre- and post-operative or non-operative intervention (Table 2).7,8,9,10,11

The study by Ramme et al⁷ involved 214 patients diagnosed with a rotator cuff injury. 107 underwent conservative treatment and the other 107 underwent arthroscopic surgery. The primary outcome of the study was the WORCnorm (Normalized Western Ontario Rotator Cuff Index), in which the pre-treatment values were 41.8 and 48.8 for the surgical and non-surgical groups, respectively, and 81.4 and 68.8 after 24 months of established treatment. For the SANE (Single Assessment Numerical Evaluation), the surgical group had pre- and post-operative values of 30.3 versus 77.5, while the non-surgical group had 35.8 versus 66.9. The VAS scale had values of 52.9 versus 45.3 before the established treatment for the surgical and non-surgical groups, respectively, and 14.4 versus 27.8 after the intervention. With regard to the ASES (American Shoulder and Elbow Surgeons score), the values found were 49.8 versus 86.1 for the pre- and post-treatment surgical group and 48.8 versus 68.8 for the non-surgical group.

The study by Godshaw et al⁸ evaluated the clinical efficacy of arthroscopic surgical treatment for rotator cuff injuries. A total of 221 patients were included, 73 of whom had suffered a traumatic injury and 148 a non-traumatic injury. The VAS scale for trauma patients preoperatively was 6.9 ± 2.1 and for the non-trauma group 7.1 ± 2.2 ; postoperatively these figures were 1.4 ± 2.4 and 2.1 ± 2.9 , respectively. The ASES (American Shoulder and Elbow Surgeons score) before and after the procedure was 28.3 ± 9.4 versus 65.4 ± 24.4 for the traumatic group and 50.8 ± 20.8 versus 64.5 ± 22.5 . The degree of external rotation varied from $46.2^\circ \pm 15.1$ to $49.4^\circ \pm 11.1$ in the trauma group and

from $49.8^\circ \pm 13.9$ to $49.5^\circ \pm 11.8$ in the non-trauma group. With regard to limb flexion, the variation was from $138^\circ \pm 43.7$ to $160^\circ \pm 14.6$ in the trauma victims and from $152^\circ \pm 29.8$ to $154^\circ \pm 25.4$ in the non-trauma victims.

The randomized clinical trial by Kukkonen et al⁹ analyzed arthroplasty and conservative treatment for rotator cuff injury. 150 patients were included, divided into three groups: 51 were treated with physiotherapy, 50 underwent acromioplasty and 49 underwent rotator cuff repair and acromioplasty. The VAS scales reported before and after the procedure were: for the physiotherapy group 2.92 versus 1.55, acromioplasty 2.62 versus 1.99 and rotator cuff repair and acromioplasty 1.73 versus 1.85. The mean Constant Murley Score for the physiotherapy group was 57.1 versus 18.5, those undergoing acromioplasty 58.2 versus 17.9 and those with rotator cuff repair and acromioplasty 58.7 versus 20.

Ranebo et al¹⁰ carried out a randomized clinical trial of patients diagnosed with rotator cuff injuries. A group of 32 participants underwent surgical repair and 26 underwent physiotherapy without repair. The assessment before and 12 months after surgery was: limb flexion 90° versus $100^\circ \pm 2$, abduction 85° versus $95^\circ \pm 2$, external rotation 60° versus 70° , the VAS scale 15 ± 5 was only reported at 12 months. With regard to patients undergoing physiotherapy, the values were: limb flexion 90° versus $98^\circ \pm 2$, abduction 65° versus $73^\circ \pm 2$, external rotation 70° versus $78^\circ \pm 2$, post-intervention VAS scale 13 ± 5 .

In the study by Lambers et al¹¹, 20 patients were included in the surgical treatment group for rotator cuff injury and 25 in the non-surgical group. The pre- and post-operative VAS scale was 6.7 versus 2.2 and 6.3 versus 3.2 for the physiotherapy-only group. The mean Constant Murley Score was 55.6 versus 81.2 pre and post-surgery and 56.9 versus 73.7 for the non-surgical group.

DISCUSSION

The most suitable treatment for repairing rotator cuff injuries is controversial, and the literature shows satisfactory results for both surgical and

non-operative interventions. However, most of the studies analyzed in this systematic review showed that the VAS (visual analog scale) had better long-term results for patients undergoing surgical treatment.^{7,8} The studies that took into account the Constant Murley Score, a functional shoulder scale, reported better prognoses for those treated with arthroplasty. The range of motion of external rotation, flexion and abduction of the limb also showed better responses to surgical treatment.^{9,10,11}

These injuries are divided into partial and complete according to the severity of the rupture of the tendon fibers and the communication between the subacromial space and the glenohumeral space.^{12,13} It is still debatable which is the best therapeutic option, since both conservative and surgical treatment have acceptable results.^{10,14,15,16}

The conservative approach is often used in partial ruptures and in patients with a degenerative tendon condition, while surgery is indicated for total ruptures.¹⁷ In addition, non-surgical therapy is advocated for elderly patients with comorbidities, while repair is suggested for younger people.¹⁸

The conservative approach consists of rest, corticoid infiltration, physiotherapy and analgesic medication such as non-steroidal anti-inflammatory drugs (NSAIDs).¹⁹ Physiotherapy should be adapted and individualized to the patient's characteristics in terms of structural and clinical results, lifestyle, level of functional disability and compliance with physical sessions.²⁰

Even though physiotherapy does not succeed in structural healing, it is widely used for atraumatic ruptures and several studies have reported its reliable and long-lasting success.^{21,22} However, some concerns remain, such as the progression of the rupture, increasing tear size, loss of strength and persistent pain.⁹ Even though it is considered a successful treatment option, the chances of a new rupture occurring vary between 20 and 90%.²³

Since spontaneous healing is not believed to occur

and physiotherapy has limited healing capabilities without repair.²⁴ Surgical treatment is a successful option.²⁵ Due to the increased use of arthroscopy, there has been a significant increase in rotator cuff repair procedures in recent decades.²⁶

This therapy aims to repair torn tendons, restoring their anatomical integrity, even if only partially. Thus, in addition to restoring function and reducing pain, shoulder surgery can have a certain impact on preventing the progression of joint degeneration in the not-too-distant future.²⁷ Patients treated surgically return to activity more quickly and generate fewer costs when compared to patients treated conservatively.²⁸ In addition, the positive results after repair do not diminish with medium and long-term follow-up.²⁹

Thus, just as conservative therapy requires certain factors to achieve success, surgery also depends, such as the size of the rupture, the pattern, the quality of the tendon, the stage of the retraction and the surgeon's experience.³⁰ This suggests that numerous structural and contextual aspects can contribute to the success of conservative and surgical treatment, corroborating the complexity and heterogeneity of the comparison.³¹

CONCLUSION

Surgical treatment for rotator cuff injuries was associated with a better prognosis, functionality, range of motion and VAS scale than non-operative treatment. Both conservative and surgical treatment have good results, but surgical repair has better results in terms of pain and faster return to daily activities. However, the best treatment is still debated.

REFERENCES

1. Ramme AJ, Robbins CB, Patel KA, Carpenter JE, Bedi A, Gagnier JJ, Miller BS. Surgical Versus Nonsurgical Management of Rotator Cuff Tears: A Matched-Pair Analysis. *J Bone Joint Surg Am.* 2019 Oct 2;101(19):1775-1782. doi: 10.2106/JBJS.18.01473. PMID: 31577683.
2. Godshaw BM, Hughes JD, Boden SA, Lin A, Lesniak BP. Comparison of Functional Outcomes After Arthroscopic Rotator Cuff

- Repair Between Patients With Traumatic and Atraumatic Tears. *Orthop J Sports Med.* 2022 Oct 25;10(10):23259671221126551. doi: 10.1177/23259671221126551. PMID: 36313008; PMCID: PMC9608059.
3. Kukkonen J, Ryösä A, Joukainen A, Lehtinen J, Kauko T, Mattila K, Äärimä V. Operative versus conservative treatment of small, nontraumatic supraspinatus tears in patients older than 55 years: over 5-year follow-up of a randomized controlled trial. *J Shoulder Elbow Surg.* 2021 Nov;30(11):2455-2464. doi: 10.1016/j.jse.2021.03.133. Epub 2021 Mar 24. PMID: 33774172.
4. Ranebo MC, Björnsson Hallgren HC, Holmgren T, Adolfsson LE. Surgery and physiotherapy were both successful in the treatment of small, acute, traumatic rotator cuff tears: a prospective randomized trial. *J Shoulder Elbow Surg.* 2020 Mar;29(3):459-470. doi: 10.1016/j.jse.2019.10.013. Epub 2020 Jan 7. PMID: 31924516.
5. Lambers Heerspink FO, van Raay JJ, Koorevaar RC, van Eerden PJ, Westerbeek RE, van 't Riet E, van den Akker-Scheek I, Diercks RL. Comparing surgical repair with conservative treatment for degenerative rotator cuff tears: a randomized controlled trial. *J Shoulder Elbow Surg.* 2015 Aug;24(8):1274-81. doi: 10.1016/j.jse.2015.05.040. PMID: 26189808.
6. Longo UG, Franceschi F, Ruzzini L, Rabitti C, Morini S, Maffulli N, Denaro V. Histopathology of the supraspinatus tendon in rotator cuff tears. *Am J Sports Med.* 2008;36(3):533-8.
7. Franceschi F, Papalia R, Palumbo A, Del Buono A, Maffulli N, Denaro V. Operative management of partial- and full-thickness rotator cuff tears. *Med Sport Sci.* 2012;57:100-13.
8. Moosmayer S, Lund G, Seljom US, Haldorsen B, Svege IC, Hennig T, Pripp AH, Smith HJ. At a 10-year follow-up, tendon repair is superior to physiotherapy in the treatment of small and medium-sized rotator cuff tears. *J Bone Joint Surg Am.* 2019;101(12):1050-60.
9. Ackmann T, Schneider KN, Schorn D, Rickert C, Gosheger G, Liem D. Comparison of efficacy of supraspinatus tendon tears diagnostic tests: a prospective study on the "full-can," the "empty-can," and the "Whipple" tests. *Musculoskelet Surg.* 2019. Epub ahead of print.
10. Walter SG, Stadler T, Thomas TS, Thomas W. Advanced rotator cuff tear score (ARoCuS): a multi-scaled tool for the classification and description of rotator cuff tears. *Musculoskelet Surg.* 2019;103(1):37-45.
11. Li S, Sun H, Luo X, Wang K, Wu G, Zhou J, et al. The clinical effect of rehabilitation following arthroscopic rotator cuff repair: a meta-analysis of early versus delayed passive motion. *Medicine (Baltimore)* 2018;97:e9625.
12. Chalmers PN, Granger E, Nelson R, Yoo M, Tashjian RZ. Factors affecting cost, outcomes, and tendon healing after arthroscopic rotator cuff repair. *Arthroscopy* 2018;34:1393-400.
13. Fukuda H. The management of partial-thickness tears of the rotator cuff. *J Bone Joint Surg Br.* 2003;85(1):3-.
14. Jo CH, Park JW, Shin JS. Changes of muscle atrophy according to the immediate postoperative time point in magnetic resonance imaging after arthroscopic rotator cuff repair. *Arthroscopy* 2016;32:2477-87.
15. Malavolta EA, Assunção JH, Ramos FF, Ferreira TC, Gracitelli ME, Bordalo-Rodrigues M, et al. Serial structural MRI evaluation of arthroscopy rotator cuff repair: does Sugaya's classification correlate with the postoperative clinical outcomes? *Arch Orthop Trauma Surg* 2016;136:791-7.
16. Elliott RSJ, Lim YJ, Coghlan J, Troupis J, Bell S. Structural integrity of rotator cuff at 16 years following repair: good long-term outcomes despite recurrent tears. *Shoulder Elbow* 2019;11:26-34.
17. Galatz LM, Ball CM, Teefey SA, Middleton WD, Yamaguchi K. The outcome and repair integrity of completely arthroscopically repaired large and massive rotator cuff tears. *J Bone Joint Surg*

Am 2004;86: 219-24.

- 18.** Coronado RA, Seitz AL, Pelote E, Archer KR, Jain NB. Are psychosocial factors associated with patient-reported outcome measures in patients with rotator cuff tears? A systematic review. Clin Orthop Relat Res 2018;476:810-29.
- 19.** Chona DV, Lakomkin N, Lott A, Workman AD, Henry AC, Kuntz AF, Huffman GR, Glaser DL. The timing of retears after arthroscopic rotator cuff repair. J Shoulder Elbow Surg. 2017 Nov;26(11):2054-2059.
- 20.** Hayashida K, Tanaka M, Koizumi K, Kakiuchi M. Characteristic retear patterns assessed by magnetic resonance imaging after arthroscopic double-row rotator cuff repair. Arthroscopy 2012;28:458-64.
- 21.** Garibaldi R, Altomare D, Sconza C, Kon E, Castagna A, Marcacci M, Monina E, Di Matteo B. Conservative management vs. surgical repair in degenerative rotator cuff tears: a systematic review and meta-analysis. Eur Rev Med Pharmacol Sci. 2021 Jan;25(2):609-619.
- 22.** Spiegl UJ, Euler SA, Millett PJ, Hepp P. Summary of meta-analyses dealing with single-row versus double-row repair techniques for rotator cuff tears. Open Orthop J 2016;10:330.
- 23.** Kim JR, Cho YS, Ryu KJ, Kim JH. Clinical and radiographic outcomes after arthroscopic repair of massive rotator cuff tears using a suture bridge technique: assessment of repair integrity on magnetic resonance imaging. Am J Sports Med 2012;40:786-93.
- 24.** Burkhart SS. Arthroscopic treatment of massive rotator cuff tears. Clinical results and biomechanical rationale. Clin Orthop Relat Res. 1991;(267):45-56.
- 25.** Longo UG, Franceschi F, Berton A, Maffulli N, Droena V. Conservative treatment and rotator cuff tear progression. Med Sport Sci. 2012;57:90-9.