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Outcomes of Surgical Intervention for Non-traumatic Rotator Cuff Tears Compared to Non-surgical Interventions in Older Adults

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ROTATOR CUFF TEAR OUTCOMES, SURGICAL VS NON-SURGICAL INTERVENTIONS.

**Outcomes of surgical intervention for non-traumatic rotator cuff tears
compared to non-surgical interventions in older adults.**

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Abstract

Background: In a given year, more than four million people will seek out medical help for shoulder pain. Of those, more than a quarter million will receive surgical intervention for rotator cuff tears. The incidence of rotator cuff injury presents at 28% in patients over 60, 50% in those over 70, and 80% in those over 80. For most people over the age of 60, surgical repair does show good improvement in function with about 20% showing failure in the surgical repair.

Purpose: The focus of this project is to critically examine the available literature surrounding treatment options available for older adults with non-traumatic rotator cuff tear, taking into account the changes associated with advancing age as related to tissue factors and long-term outcomes. Analysis will be directed to answer the PICO question: In older adults, what are the outcomes of surgical intervention for non-traumatic rotator cuff tears compared to non-surgical intervention?

Case Description: Mrs. J was an administration worker who was seen at an outpatient physical therapy facility for a symptomatic shoulder after a diagnosis of a partial tear to her rotator cuff. She had undergone a previous repair for a full thickness tear of the same shoulder.

Discussion: In the review and analysis of current evidence on this topic, several factors are presented to indicate the appropriateness for surgery and the benefits of non-surgical methods for selected individuals. Younger, symptomatic individuals with smaller tears, and older individuals with full thickness tears show better long-term outcomes when treated with conservative interventions.

Conclusion: For Mrs. J this information would have been greatly beneficial given her age and the subsequent tissue changes associated with advancing age. Research directed at adaptation to circumvent injuries, specifically retraining of surrounding musculature to accommodate the lost function of the rotator cuff, shows growing promise. Given Mrs. J's age, level of activity, the needs of her job, and her overall constitution, the decision to undergo surgery may have been premature. More research points now to the gains achievable in a period of six weeks of conservative treatment, to include physical therapy and other non-surgical interventions, prior to a decision to undergo surgery. Therefore Mrs. J may have missed an opportunity to improve with conservative management following her initial rotator cuff tear.

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Background/Purpose

The complexity of the shoulder and its anatomy are what allow for the mobility and stability necessary for proper function. The rotator cuff, the group of muscles and tendons responsible for stabilizing the shoulder joint during movement, can suffer from injury or disease. Individuals who are subject to repetitive stresses and middle-aged and older adults are most commonly affected (Arthur et al., 2004).

Shoulder pain afflicts almost 4.5 million people in the US and many of those individuals will seek out medical intervention. Nearly 250,000 of those individuals will be diagnosed with some form of rotator cuff tear (Value of Orthopaedic Treatment: Rotator Cuff, 2016; Ackland et al, 2016). Of those medical interventions available in the treatment of a rotator cuff tear, the simplest, and for those individuals with a very minimal tear, pain and dysfunction, is traditional over the counter anti-inflammatories and rest. For those individuals with more severe pain but with minimal damage to the tendons involved, there is the use of steroids either in pill form or by injection directly into the joint. Also, there are advances in surgical repair of rotator cuffs, the open and mini-open surgical options having been replaced by the development of arthroscopic repair methods. Even experimental treatments, like the use of platelet rich plasma injections to facilitate the healing process within the shoulder itself, are available. More conservative treatment options are also accessible, with conservative physical therapy becoming a more mainstream option to treat different widths of tears for individuals with varying backgrounds.

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The rotator cuff's purpose is the orientation and stabilization of the humeral head against the glenoid fossa of the scapula during rest and motion, with the supraspinatus muscle and tendon making up the superior aspect of this musculotendinous support. Dysfunction and injury to any of the rotator cuff muscles is detrimental to functional aspects of upper extremity movements like forward flexion, abduction, internal and external rotation along with the associated pain of irritated tissues and loss of strength from inappropriate movement patterns (Schmidt et al. 2015). These impairments translate to a functional loss in the ability to reach out to the side and overhead; the motions necessary to put on a shirt, wash one's hair or put away or get something from a high shelf.

The primary objectives of non-operative management of a rotator cuff tear are to decrease pain, increase function, and enhance activities of daily living while mitigating potential long term adverse outcomes. Physical therapy interventions include strengthening of scapulothoracic muscles and primary and secondary glenohumeral muscles, specifically the rotator cuff and deltoid respectively. Stretches are designed to maintain flexibility of the glenohumeral joint capsule and associated soft tissue structures, and postural and movement reeducation for the scapula and scapulohumeral rhythm is included. (Ackland et al. 2016).

Postoperative management protocols initially focus on protecting the healing surgical site, which involves a period of immobilization followed by passive motion only. As the surgical site continues to heal, the regimen progresses through active assisted ranges of motion and, at approximately six months, moves to a gentle return to previous activities (Brigham, 2007).

But positive surgical outcomes decline with age (Value of Orthopaedic Treatment: Rotator Cuff, 2016). By the US census, the population over 65 years of age will double by 2050, increasing

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from 43.1 to 83.7 million individuals (“An Aging Nation”, 2014). With this growing population of older individuals, and taking into account the accompanying tissue changes associated with advancing age, surgical interventions may be less effective and costlier for the geriatric population than for younger populations. Surgical interventions for the shoulder may also become more prevalent, considering that the current rate of rotator cuff injury is as high as 80% by the time an individual is 80 years old (Geary & Elfar, 2015). With that in mind I ask: In older adults, what are the outcomes of surgical intervention for non-traumatic rotator cuff tears compared to non-surgical intervention?

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Case Description

Mrs. J was a 67-year-old female seen at an outpatient physical therapy clinic for shoulder pain and weakness. Her prior surgical history included a rotator cuff repair two years ago. Prior to her surgery, she had had no considerable pain and only moderate difficulty with reaching above her shoulder or out to the side. There was no trauma associated with the initial injury and both an ultrasound and MRI confirmed a full-thickness (3cm) tear of her supraspinatus tendon. She was still an active worker and had received surgery within days of the diagnosis.

After the primary tendon repair surgery and postoperative physical therapy sessions, she reported residual discomfort in the shoulder and with most movements of the shoulder, which she managed with Aleve. Despite this discomfort, she reported an improved ability to perform activities above 90 degrees of shoulder flexion following the surgery.

Without any associated cause, she woke up one day with increased pain and a renewed difficulty lifting her arm above 90 degrees. Upon this new onset of difficulty, she sought out physical therapy with the hope of recovering without needing a second surgery. Her specific goals were to be able to wash her own hair and put on a blouse by herself again.

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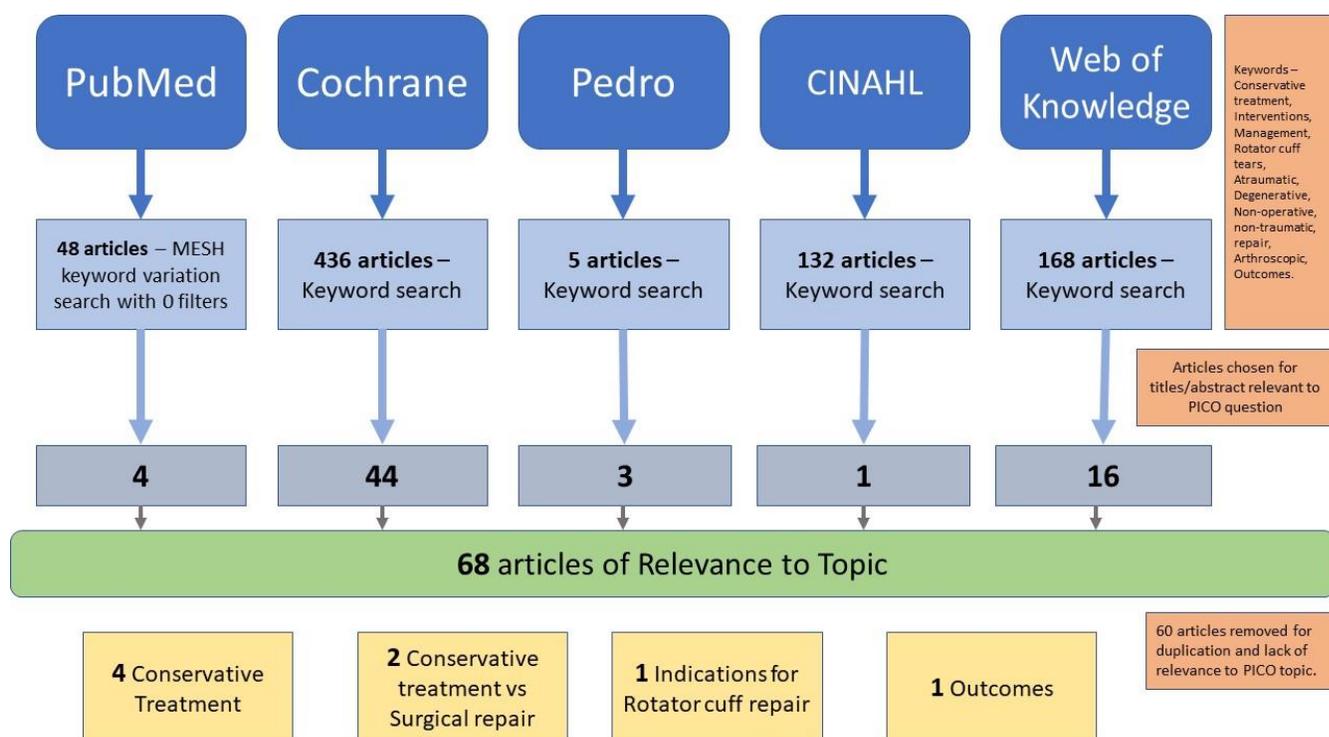
Methods

Medical research databases PubMed, Cochrane, Pedro, CINAHL and Web of Knowledge were searched in May 2017 limited by time relevance of 15 years from date of search. Keyword searches were performed across all databases with MESH terms used where appropriate. Search terms used included: Conservative treatment or interventions or management, rotator cuff tears, atraumatic, degenerative, non-operative, non-traumatic, repair, arthroscopic, outcomes. Articles were then chosen by title and abstract review and relevance to PICO question. Of the 68 articles selected, based on relevance of title and abstract to the topic, 59 articles were dropped based on duplication between databases and lack of relevance. Five articles were selected that addressed comparative outcomes of surgical versus conservative treatment of various evidence levels. Three additional articles indirectly applied to the PICO question and were included: One article on degenerative tear management, one on a specific physical therapy treatment protocol, and one on the decision to perform surgical correction.

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Articles included:

1. Arthur et al. (2004)
2. Clement et al. (2012)
3. Huisstede et al. (2011)
4. Kuhn et al. (2013)
5. Kukkonen et al. (2015)
6. Lee et al. (2016)
7. Moosmayer et al. (2014)
8. Oh et al. (2007)



Article Summaries

Reference 1: Arthur, A., Grant, H., & Pichora, D. (2004). Evaluation of interventions for rotator cuff pathology: A systematic review. *Journal of Hand Therapy*. 17(2).

doi:10.1197/j.jht.2004.02.013

Oxford Level of Evidence: 1a **Pedro Score:** 6

Purpose: The purpose of this article was to compile available information comparing surgical and non-surgical rehabilitation of rotator cuff tears.

Methods: The studies included had to follow the criteria of being about surgical and nonsurgical interventions, including full and partial thickness tears, lesions, tendonitis and tendinopathies of the rotator cuff musculature, along with impingement syndromes, tendon calcification and bursitis. Studies included adult patients, and rheumatologic disorders were excluded, resulting in 64 articles.

Results: There is a clear need for further research on the viability of conservative treatment for rotator cuff disease as compared to surgical correction in adult patients.

Clinical Bottom Line: By this article's review there is not enough evidence to confirm or deny the use of one treatment form over another.

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Reference 2: Clement, N. D., Nie, Y. X., & Mcbirnie, J. M. (2012). Management of degenerative rotator cuff tears: a review and treatment strategy. *Sports Medicine, Arthroscopy, Rehabilitation, Therapy & Technology*, 4(1). doi: 10.1186/1758-2555-4-48

Oxford Level of Evidence: 2b **Pedro Score:** 6

Purpose: This article was meant to present an overview of degenerative rotator cuff tears and a suggested management protocol based upon current evidence.

Methods: The article reviewed several diagnostic evaluations: Neer's sign and Hawkins's sign for impingement, Horn blowers sign, Jobe's and Gerber's belly press tests for specific cuff muscles; teres minor, supraspinatus and subscapularis respectively. They used diagnostic imaging: plain radiographs; to assess acromiohumeral spacing and morphology, and the glenohumeral joint to grade the severity of rotator cuff arthropathy. With all shoulders examined undergoing MRI, the gold standard for assessment of the rotator cuff, to corroborate findings from other imaging. The article also reviews the natural development of rotator cuff tears with age. For non-operative management, the examined protocols were injections of both hyaluronate and steroid, and conservative rehabilitation over the course of six weeks, both as treatment and as a baseline for post-surgical rehab. For operative management, the article reviews single and double anchor reattachment of the supraspinatus tendon done through open, mini-open and arthroscopic repair.

Results: Of injection therapies, the authors concluded that steroids and hyaluronate had no significant effect on full tears but hyaluronate showed promise with partial tears. Regarding conservative functional rehabilitation, there was debate about the use of it for extended

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periods as it could lead to propagation and even fatty infiltration. Operative management showed that almost 40% of surgeries have a post-surgical complication, and that re-rupture occurs in 13%-68% of cases, even though the patient might demonstrate an improvement in pain and function.

Clinical Bottom Line: When it comes to non-acute injury of the rotator cuff, a period of conservative treatment shows a decent capacity for improvement when operative management is not viable or selected. Of surgical options, a mini-open or arthroscopic repair of the double anchor bridge is best for reducing re-rupture rates.

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Reference 3: Huisstede, B. M., Koes, B. W., Gebremariam, L., Keijsers, E., & Verhaar, J. A. (2011). Current evidence for effectiveness of interventions to treat rotator cuff tears. *Manual Therapy, 16*(3), 217-230. doi:10.1016/j.math.2010.10.012

Oxford Level of Evidence: 1b **Pedro Score:** 5

Purpose: The article is a systematic review assessing the effectiveness of non-surgical and (post)surgical interventions for symptomatic rotator cuff tears.

Methods: Article search parameters included disorder terms 'rotator cuff tear' and 'supraspinatus tear'. Interventions; NSAID use, Anti-inflammatory injections and physical therapy; surgical interventions included irrigation and debridement and tendon repair were included in the literature review. Inclusion criteria were randomized controlled trials involving patients with rotator cuff tears that were not caused by acute trauma or systemic disease. Those treatment interventions examined in the article were evaluated for pain, function or recovery with a follow-up window no less than 2 weeks.

Results: For non-surgical interventions, it was concluded that exercise, either in isolation or as part of a comprehensive treatment, had some benefit. No absolute benefit was seen for injection of either hyaluronate or steroid, but steroid with exercise was shown to have some benefit. For surgical interventions, it was found more effective for small (<1cm) and medium (1-3 cm) symptomatic tears, with limited evidence in favor of debridement over repair. Post-surgical treatment was more unclear, with concerns discussed for differentiating between tendinitis and bursitis

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Clinical Bottom Line: For small and medium tears that are symptomatic, a surgical repair shows the best outcomes when paired with post-surgical exercise. For full tears, both symptomatic and asymptomatic show positive outcomes (reduced pain and increased function) with muscle reeducation. At this time, there is still more need for research in comparing non-surgical and surgical treatment of rotator cuff tears.

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Reference 4: Kuhn, J. E., Dunn, W. R., Sanders, R., An, Q., Baumgarten, K. M., Bishop, J. Y., . . .

Wright, R. W. (2013). Effectiveness of physical therapy in treating atraumatic full-thickness rotator cuff tears: a multicenter prospective cohort study. *Journal of Shoulder and Elbow Surgery*, 22(10), 1371-1379. doi:10.1016/j.jse.2013.01.026

Oxford Level of Evidence: 4 **Pedro Score:** 3

Purpose: To assess the effectiveness of a specific nonoperative physical therapy program in treating atraumatic full-thickness rotator cuff tears using a multicenter prospective cohort study design.

Methods: 452 patients were selected to participate in the specific program. Patients were provided an instructional rehabilitation book for home-based physical therapy with accompanying DVD; this included daily range of motion (both active and passive), daily flexibility (anterior and posterior stretches), and strengthening exercises (prescribed three times a week for rotator cuff and scapular musculature). Outpatient physical therapy was performed as needed to progress patients to the home-based exercise program. Patients returned for evaluation at 6 and 12 weeks with a telephone contact at 1 and 2 years.

Results: Patient-reported outcomes improved significantly at 6 and 12 weeks. Patients elected to undergo surgery less than 25% of the time. Patients who decided to have surgery generally did so between 6 and 12 weeks and few chose to have surgery between 3 and 24 months.

Clinical Bottom Line: The treatment protocol showed effectiveness for approximately 75% of patients at the two-year follow-up.

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Reference 5: Kukkonen, J., Joukainen, A., Lehtinen, J., Mattila, K. T., Tuominen, E. K., Kauko, T., & Äärimaa, V. (2015). Treatment of nontraumatic rotator cuff tears. *The Journal of Bone and Joint Surgery*, 97(21), 1729-1737. doi:10.2106/jbjs.n.01051

Oxford Level of Evidence: 1b **Pedro Score:** 4

Purpose: The article's purpose was to compare the effectiveness of physiotherapy, acromioplasty, and rotator cuff repair for the treatment of symptomatic, nontraumatic rotator cuff tears with the hypothesis that rotator cuff repair will yield a superior result.

Methods: 180 symptomatic, nontraumatic, supraspinatus tears in adults >55 years old were randomized into one of the three intervention groups. The Constant score was the primary outcome measure. Secondary outcome measures were Visual Analog Scale (VAS) for pain, patient satisfaction, rotator cuff integrity in a control imaging investigation, and cost of treatment.

Results: 167 shoulders were available for analysis at two years. There were no significant differences in Constant scores between the three groups and no significant difference in VAS and satisfaction scores between the groups. Tear size was smaller in the rotator cuff repair group compared to groups 1 and 2. Rotator cuff repair and acromioplasty were significantly more expensive compared to physiotherapy alone.

Clinical Bottom Line: While this article has only a small sample size, it shows strength in its follow-up. Considering the outcome measures used, it suggests that physical therapy could be both equally beneficial and less expensive treatment option for symptomatic, nontraumatic, supraspinatus tears in older patients.

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Reference 6: Lee, W. H., Do, H. K., Lee, J. H., Kim, B. R., Noh, J. H., Choi, S. H., . . . Lim, J. (2016).

Clinical outcomes of conservative treatment and arthroscopic repair of rotator cuff tears: A retrospective observational study. *Annals of Rehabilitation Medicine*, 40(2), 252.

doi:10.5535/arm.2016.40.2.252

Oxford Level of Evidence: 2b **Pedro Score:** 3

Purpose: The article's purpose was to compare the clinical outcomes following conservative treatment and arthroscopic repair in patients with a rotator cuff tear.

Methods: A retrospective study of patients over the age of 50 with a symptomatic rotator cuff tear. Rotator cuff tendons were evaluated with Ultrasonography, MRI or MRA (arthrography), and patients with either high-grade partial-thickness or small-to-medium sized (\leq 3cm) full thickness tears were included. Outcome measures were pain assessment score and range of motion at one-year follow-up. Secondary outcomes were rate of tear progression or re-tear, along with the rate of symptom aggravation after the treatments.

Results: Of the 357 patients enrolled, 183 received conservative treatment and 174 received an arthroscopic repair. Both pain assessment score ($p < 0.001$) and range of motion ($p < 0.001$) were significantly improved in both groups, without significant difference in scores between groups. Re-tear occurred in 9.6% of patients that underwent the arthroscopic repair and tear progression was observed in 6.7% of those that underwent conservative treatment. Pain aggravation and range of motion were not significantly different between groups.

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Clinical Bottom Line: Conservative treatment is not an inferior choice to arthroscopic repairs for older adult patients with smaller than 3cm tears. Severity of tear does not determine the treatment effect or failure.

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Reference 7: Moosmayer, S., Lund, G., Seljom, U. S., Haldorsen, B., Svege, I. C., Hennig, T., . . .

Smith, H. (2014). Tendon repair compared with physiotherapy in the treatment of rotator cuff tears. *The Journal of Bone and Joint Surgery-American Volume*, 96(18), 1504-1514.

doi:10.2106/jbjs.m.01393

Oxford Level of Evidence: 1b **Pedro Score:** 8

Purpose: The article compared outcomes of patients with primary tendon repair to outcomes of patients treated with physiotherapy, and optional secondary tendon repair if needed.

Methods: 103 patients selected with rotator cuff tear not exceeding 3cm were divided; 52- primary tendon repair surgery and 51-physiotherapy. The primary outcome measure was the Constant score. Secondary outcome measures include self-report section of the American Shoulder and Elbow Surgeons score, physical component of Short Form 36 Health survey, measurement of pain with the Visual Analog Scale (VAS), strength, and shoulder motion, patient satisfaction and findings from MRI and sonography. With follow up at 6 months, one, two and five years conducted in a secondary-care institution.

Results: 98% response at 5-year follow up. Twelve of the 51 patients in the physiotherapy group were treated with secondary tendon repair. Primary tendon repair results were superior to those from physiotherapy plus secondary repair. Between group mean difference was 5.3 points on the Constant score ($p=0.05$), 9.0 points on the American Shoulder and Elbow Surgeons score ($p<0.001$), 1.1cm on the 10cm VAS for pain ($p<0.001$), 1.0cm on the 10cm VAS for patient satisfaction ($p=0.03$). In 37% of tears treated with only physiotherapy, there were increasing tear sizes on ultrasound of $>5\text{mm}$, over 5 years, associated with inferior outcome.

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Clinical Bottom Line: In this study, primary repair of small/medium-sized tears was associated with better outcomes, although the difference between the two treatments was small and may not be clinically important. By this article, further research is needed and warranted.

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Reference 8 : Oh, L. S., Wolf, B. R., Hall, M. P., Levy, B. A., & Marx, R. G. (2007). Indications for rotator cuff repair. *Clinical Orthopaedics and Related Research*, 455, 52-63.

doi:10.1097/blo.0b013e31802fc175

Oxford Level of Evidence: 4 Pedro Score: 3

Purpose: This article was a systematic review of literature to examine factors influencing the decision to surgically repair symptomatic, full-thickness rotator cuff tears. Questions examined: How do demographic variables influence the outcome of rotator cuff tears, operative and non-operative and should any demographic criteria be used for indicating patients for surgery? How does acuity/chronicity of rotator cuff tear or timing of surgery affect treatment outcome? How do physical examination findings affect treatment outcomes, and subsequently indications for surgery? How do radiographic and intraoperative findings affect treatment outcomes and indications for surgery?

Methods: The 50 studies included in this review were selected on the criteria of: studies limited to full-thickness rotator cuff tears/ discussed indications for surgery; contained clinical outcome data following either nonoperative treatment or operative intervention; and outcome data limited to humans.

Results: Three demographic variables possibly influencing outcomes after operative or non-operative treatment of rotator cuff tears were selected: age, gender, and pending worker's compensation claims. A patient's age should not be considered a contraindication for operative repair due to the wide variability in this group's activity level. A patient's gender was also found to be limited as a factor for influencing outcomes in operative and non-operative treatment for

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rotator cuff tears. Those patients who had pending worker's compensation claims tended to have a lower patient satisfaction ratings with regard to non-operative treatment for rotator cuff pathology. Those who were gainfully employed preoperatively returned to work after surgery, but at a lower activity level.

Clinical Bottom Line: Considering the age of this study and its commentary on the limited evidence for treatment guidelines, it can be added to the list of studies that call for a greater body of research around the benefit of non-operative treatment compared to surgical options for treating rotator cuff tears.

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Articles Analyzed Summary

| Author | Oxford Score | Pedro Score | Purpose | Outcome measures employed | Results | PICO Question Answered? |
|---|--------------|-------------|---|--|---|-------------------------|
| Arthur, A. et al. | 1a | 6 | Compilation of available information comparing surgical and non-surgical rehabilitation of rotator cuff tears. | Pain and disability index, VAS pain score, ROM, Strength, Constant-Murkey Shoulder Function, UCLA Shoulder Rating scale, X-ray, VAS and four-point ratio pain scores, University of Pennsylvania shoulder score, Constant Score, Six-point Likert, Seven-point Likert Improvement scale. | There is a clear need for more research on the viability of conservative treatment. | No |
| Clement, M. D., Nie, Y. E., McBirnie, J. M. | 2b | 6 | Present an overview of degenerative rotator cuff tears and a suggested management protocol based upon current evidence. | MRI and Ultrasound scanning. | Injection treatments had no significant effect on full tears, but hyaluronate showed promise with partial tears. Conservative treatment shouldn't be used for extended periods. | Yes |
| Huisstede, B. M. et al. | 1b | 5 | A systematic review assessing the effectiveness of non-surgical and post-surgical interventions for symptomatic rotator cuff tears. | Constant score, ASES, DASH, Strength, UCLA score, Shoulder Rating Questionnaire, Rotator Cuff-Quality of Life, SRQ score, MRI, ROM, UPenn score, VAS, SPADI | For non-surgical interventions, exercise had some benefit. No absolute benefit for injection treatments. For surgical interventions small and | No |

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| | | | | | medium symptomatic tears benefited. Post-surgical treatment was unclear. | |
| Kuhn J. E. et al. | 4 | 3 | Assessment of effectiveness of a specific nonoperative PT program in treating atraumatic full-thickness tears. | SF-12, American Shoulder and Elbow Surgeons score, Western Ontario Rotator Cuff index score, Single Assessment Numeric Evaluation score, Shoulder Activities Scale. | Patient-reported outcomes improved at 6 and 12 weeks. Elective surgery was undertaken less than 25% of time. Elective surgery was undertaken between 6 to 12 weeks, with few around 3 and 24 months. | Yes |
| Kukkonen, J. et al. | 1b | 4 | Compare effectiveness of physiotherapy, acromioplasty, and rotator cuff repair treatment of symptomatic and non-symptomatic rotator cuff tears. With 2-year follow up. | Constant score, VAS, subjective patient satisfaction. | No significant difference in Constant score between the three groups. Acromioplasty and Rotator cuff repair were significantly more expensive. | Yes |
| Lee, W. et al. | 2b | 3 | Comparing clinical outcomes following conservative treatment and arthroscopic repair in patients with a rotator cuff tear. | Constant Score, ASES, MRI, Sonography | No significant difference between groups for pain and ROM. Re-tear rate for surgical patients was 9.6% and tear progression was 6.7% in conservative treatment group. | Yes |

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|---|----|---|---|--|--|-----|
| Moosmayer, S. et al. | 1b | 8 | Comparing primary tendon repair with outcomes of patients treated with physiotherapy and optional secondary tendon repair in 103 patients. With a 5-year follow-up. | Constant score, ASES score, VAS for pain, VAS for patient satisfaction | Primary tendon repair showed significantly (small) superior outcomes compared to physiotherapy and secondary tendon repair. | Yes |
| Oh, L. S. et al. | 4 | 3 | Literature review to examine factors influencing decisions to surgically repair symptomatic, full-thickness rotator cuff tears. | Constant score, UCLA score, Simple shoulder test, external rotation, forward flexion | Age, gender and pending workers' compensation claims showed possible influence on outcomes of operative and non-operative treatment of RCTs. | No |
| <p>ASES – American Shoulder and Elbow Surgeons Shoulder score, DASH – Disabilities of Arm, Shoulder and Hand Score. MRI – Magnetic Resonance Imaging. ROM – Range of Motion. SF-12 – Short Form Health Survey. SPADI – Shoulder Pain and Disability Index. SRQ – Shoulder Rating Questionnaire. UCLA – University of California at Los Angeles Shoulder score, VAS – Visual Analog Scale of Pain.</p> | | | | | | |

Discussion

Decision making for surgery. The demographic information currently most prevalent to suggest a need for surgical repair are those of age, gender and pending worker's compensation claims. Considering the changes associated with chronological age, reduced healing capacities, reduced collagen and tendon quality ("Age and its Effects", n.d.), there was no finding in this literature review that specifically suggests older individuals will not benefit from surgical intervention, though the outcomes measured pointed at more of a subjective improvement in older individuals over documentable improvement in range of motion or strength (Oh et al., 2007). For Mrs. J, this provides some credence for the decision made to perform her rotator cuff repair surgery.

Gender discussions and comparisons of outcomes have been found to be negatively associated for females, regardless of age at time of surgery, compared to males. Outcomes for females include poor shoulder scores, higher levels of pain, and decreased improvement in range of motion postoperatively. With slightly greater than 50% of the population being female ("An ageing Nation", n.d.) and greater than 50% of new cases in patients older than 60 being female, this presents a trend suggesting poorer outcomes for an individual like Mrs. J. (Elfar et al., 2015. Grondel et al., 2001).

Of interest was also the finding that a pending workers' compensation claim had lower patient satisfaction ratings with regards to non-surgical treatment of rotator cuff pathologies (Oh et al., 2007). This was also found in patients who had other pending insurance claims (Clement et al., 2012).

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The American Academy of Orthopedic Surgeons developed The Appropriate Use Criteria for conservative treatment of rotator cuff tears. One of the criteria is 'It is *always appropriate*' to opt for conservative care if the patient responds positively to that conservative care (Schmitt, et al., 2015), and we can conclude that an initial series of physical therapy sessions may present a way to reduce the influx of shoulder surgeries for patients that may improve without surgical intervention.

Degenerative/Atraumatic management. Current research into the treatment of degenerative and atraumatic management of rotator cuff pathologies is associated with symptomatic and painful shoulder dysfunction. Several studies have found that pain reduction and strength and range of motion improvements are gained through conservative treatment, and that most of those individuals will respond within the first six to twelve weeks (Schmitt et al., 2015; Kuhn et al., 2013; Clement et al., 2012). One study looked into conservative treatment for atraumatic and asymptomatic full thickness tears and showed positive effects in both active range of motion of forward elevation [149 - 162] and abduction [136 - 154], progression of tear size (48% progressed minimally) and that of the 90% of patients that reached the two- year follow-up, only 26% had undergone surgical repair (Kuhn et al., 2013).

Treatments involved in conservative treatment. Of the literature reviewed, a number of treatments have been grouped under the "Conservative Treatment" title. Low level or initial symptom manifestation is often treated with oral NSAIDs [Non-steroid anti-inflammatory drugs] and/or the use of steroid injections, usually employed in the sub-acromial space. Advances in adjunct therapies is the use of metabolic treatments like PRP (Platelet Rich Plasma) injections to reduce the need for surgical repair and improved self-healing outcomes, though

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little research into such experimental treatments is currently forthcoming (Ackland et al., 2016; Petri et al., 2016; Schmitt et al., 2015). For the literature reviewed examining the effectiveness of exercise/physical therapy, there is a growing collection of research pointing to an equivalency between non-surgical exercise treatment outcomes and surgical repair outcomes (Arthur et al., 2004; Kuhn et al., 2013).

Outcomes comparison. Throughout the literature reviewed comparing outcomes between exercise/conservative/physical therapy and surgical treatment, several themes developed. Within the surgeries examined were primary tendon repair of the supraspinatus tendon and sub-acromial decompressions or acromioplasty, followed by post-surgical therapy protocols of conservative treatment with NSAIDs and physical therapy. Secondary to this is the size of tears, traumatic or atraumatic nature, symptomatic nature and age of patients examined (Arthur et al., 2004; Huisstede et al., 2011; Grondel et al., 2001; Elfar et al., 2015).

The size of tears found to benefit equally from surgical or non-surgical treatment were those of small and medium size. This is connected to patients greater than 50 years of age with symptomatic shoulders (Lee et al., 2016) as individuals of lesser age tend to choose surgical repair for return to work options. The greater the size of the tear, the lesser the outcomes when conservative treatment is selected (Oh et al., 2007).

Traumatic tears, usually associated with younger individuals and symptomatic presentations, showed significant improvement in both surgical and non-surgical groups measured by Constant score and active range of motion (Ackland et al., 2016; Schmitt et al., 2015). The concern for asymptomatic shoulders is that they will become symptomatic, with one study

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finding that in bilateral rotator cuff injuries, if one is symptomatic and the other is not, there is a greater propensity for the asymptomatic shoulder to become symptomatic (Arthur et al., 2004; "Value of Orthopaedic", n.d.; Ryosa et al., 2016).

Age was one of the few constants throughout the literature, with all reviewed articles containing populations greater than 50 years of age with an average age of 62 years. Age was found to be a minimal factor in the decision to undergo surgery (Moosmayer et al., 2014; Clement et al., 2012; Lee et al., 2016). The outcomes associated with individuals greater than 65 years of age undergoing surgical repair were not as great as those for younger individuals (Huisstede et al., 2011). Re-ruptures presented more often in individuals over the age of 65 (Elfar et al., 2015; Grondel et al., 2001). Of note is an extensive article looking specifically at atraumatic full thickness tears in individuals over 60 years of age that showed improvement equal to surgical intervention in function with conservative treatment (Kukkonen et al., 2015).

Conclusion

In conclusion, there is a significantly growing body of evidence that suggests outcomes of conservative treatment are not inferior to surgical repairs in individuals older than 50 years of age with rotator cuff tears of various sizes from small to full thickness. Of those articles reviewed, several concerns arose. Throughout the literature there is an inconsistency in size designation and seems to be associated with the diagnosing physician (Clement et al., 2012; Schmitt et al., 2015). As a standardized outcome measure, the Constant score is used liberally throughout researched focused on shoulder dysfunctions ("Constant", n.d.), but there is uncertainty in what constitutes a Minimal Detectable Change in comparing the outcomes between various forms of treatment for the shoulder (Henseler et al., 2015).

Further research is warranted in determining the effectiveness of conservative treatment for rotator cuff tears compared to surgical interventions. A focus should be placed on more multicenter trials, and examination into the factors that lead to tear progression and prognostic factors associated with re-rupture in surgically corrected shoulders should be taken into consideration when directing patients to an appropriate intervention.

Taking into account the growing body of knowledge surrounding the use of conservative non-surgical options for treating rotator cuff tears, I am of the opinion that Mrs. J's initial surgery was inappropriate given the factors of her age, level of activity, job necessities and hobbies of interest. More and more research is showing that individuals over 60 are at increased risk of complications from surgery and increased risk of tear reoccurrence. Surgical interventions are also suggested more for individuals who have symptomatic presentations or who need

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complete restoration of motion for their job or activities. With all this taken into account, the initial direction of treatment for Mrs. J should have been a course of physical therapy with a reassessment after at least six weeks.

Appendix A

Article Analysis Worksheets

Reference 1:

Citation: Arthur, A., Grant, H., & Pichora, D. (2004). Evaluation of interventions for rotator cuff pathology: A systematic reivew. *Journal of Hand Therapy*. 17(2). doi:10.1197/j.jht.2004.02.013

Level of Evidence (Oxford Scale): 1a

Pedro Score:

| Does the design follow the Cochrane Method? | |
|--|---|
| Appraisal Criterion | Reader's Comments |
| <p>Formulating the Question: Do the authors identify the focus of the review? A clearly defined question should specify the types of: people (participants), interventions or exposures, outcomes that are of interest, studies that are relevant to answering the question.</p> | <p>Yes. The focus of the review was in exploring the gaps in research associated with outcomes and efficacy for available treatment methods for rotator cuff tears.</p> |
| <p>Locating Studies: Did they include multiple databases? Was the search strategy defined and include bibliographic databases used as well as a hand searching terms (Keywords and index terms)? Citation searching: reference lists? Contact with 'experts' or identify 'grey' literature (body of materials that cannot be found easily through conventional channels such as publishers)? Sources for 'grey' literature?</p> | <p>Yes, using Medline, CINAHL, Pedro and the Cochrane Collaboration library. For this systematic review no grey material was discussed or appears to be included.</p> |
| <p>Critical Appraisal for Inclusion: Were criteria for selection specified? Did more than one author assess the relevance of each report? Were decisions concerning relevance of each report? Were decisions concerning relevance described completed by non-experts, or both? Did the people assessing the relevance of studies know the names of the authors, institutions, journals of publication and</p> | <p>Yes, specifically those articles that examined outcomes of various treatment interventions for rotator cuff pathology. All relevancy concerns were completed by two independent experts.</p> |

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| results when they apply the inclusion criteria? | |
| Collection of the Data: Was the collection data used and is it included? Are the studies coded and is the data coding easy to follow? Were studies identified that were excluded & did they give reasons why (i.e., which criteria they failed to include)? | <p>The data used to determine inclusion in the review was included. The data was coded according to a given treatment intervention. Articles excluded from the review were those that did not examine treatment effects, were narrative reviews or did not include rotator cuff patient group.</p> |

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| Are the results of this SR valid? | |
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| Is this a SR of randomized controlled trials? Did they limit this to high quality studies at the top of the hierarchies? If not, what types of studies were included? What are the potential consequences of including these studies for this review's results? | No. Case and cohort studies were included in this review. |
| Did this study follow the Cochrane methods selection process and did it identify all relevant trials? If not, what are the consequences for this review's results? | With limited high quality research examining the comparison between conservative and surgical interventions for rotator cuff tears the inclusion of lower quality articles is inevitable. |
| Do the methods describe the processes and tools used to assess the quality of individual studies? If not, what are the consequences for this review's results? | The authors reviewed articles based on Sackett's Levels of evidence and work published by Guyatt, Oxman, and the Evidence-based Working group. Grades of recommendation were also applied. |
| What was the quality of the individual studies included? Were the results consistent from study to study? Did the investigations provide details about the research validity or quality of studies included in the review? | Individual studies included ranged in evidence level between 1b and 4 on the Sackett's level of Evidence. Articles were reviewed based on Sackett's Levels of Evidence. |
| Did the investigators address publication bias? | No discussion was performed to address publication bias. |

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| Are the valid results of this SR important? |
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| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
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| Were the results homogenous from study to study? If not, what are the consequences for this review's results? | Again, due to the lower number and quality of available research into outcome effects of rotator cuff tear interventions the demographics for the included articles ranged greatly. |
| If the paper is a meta-analysis, did they report the statistical results? Did they include a forest plot? What other statistics do they include? Are these Cis? | |
| From the findings, is it apparent what the cumulative weight of the evidence is? | By the authors the current amount of evidence points toward a need for more research in determining the effectiveness of any currently available treatment intervention for rotator cuff pathology. |

| Can you apply this valid, important evidence from this SR in caring for your patient/client? What is the external validity? | |
|---|---|
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| Is your patient different from those in this SR? | My patient falls within the demographic ranges included in this article. |
| Is the treatment feasible in your setting? Do you have the facilities, skill set, time, 3rd party coverage to provide this treatment? | At an outpatient physical therapy clinic the exercise treatment intervention is feasible and I possess the skill set necessary. |
| Does the intervention fit within your patient/client's stated values or expectations? If not, what will you do now? | Given my patient's previous surgery and desire to avoid another surgical round the exercise treatment fits within her desire and stated values. |

| What is the Bottom line? | |
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| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| Summarize your findings and relate this back to clinical significance. | While there is insufficient evidence to claim that one treatment intervention is superior to another for rotator cuff pathologies the cost and time requirement for applying exercise therapy provides, in my opinion, a practical superiority. |

Reference 2:

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Citation: Clement, N. D., Nie, Y. X., & Mcbirnie, J. M. (2012). Management of degenerative rotator cuff tears: a review and treatment strategy. *Sports Medicine, Arthroscopy, Rehabilitation, Therapy & Technology*, 4(1). doi: 10.1186/1758-2555-4-48

Level of Evidence (Oxford Scale): 5

Pedro Score:

| Does the design follow the Cochrane Method? | |
|---|--|
| Appraisal Criterion | Reader's Comments |
| Formulating the Question: Do the authors identify the focus of the review? A clearly defined question should specify the types of: people (participants), interventions or exposures, outcomes that are of interest, studies that are relevant to answering the question. | Yes, to present an overview of degenerative rotator cuff tears and a suggested management protocol based on current evidence. |
| Locating Studies: Did they include multiple databases? Was the search strategy defined and include bibliographic databases used as well as a hand searching terms (Keywords and index terms)? Citation searching: reference lists? Contact with 'experts' or identify 'grey' literature (body of materials that cannot be found easily through conventional channels such as publishers)? Sources for 'grey' literature? | No discussion of databases used to collect the reviewed articles was included in the article. |
| Critical Appraisal for Inclusion: Were criteria for selection specified? Did more than one author assess the relevance of each report? Were decisions concerning relevance of each report? Were decisions concerning relevance described completed by non-experts, or both? Did the people assessing the relevance of studies know the names of the authors, institutions, journals of publication and results when they apply the inclusion criteria? | No criteria for selection was included, unknown if more than one author assessed the relevance of the articles included. No description of relevance was included. |
| Collection of the Data: | No. |

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| <p>Was the collection data used and is it included?</p> <p>Are the studies coded and is the data coding easy to follow?</p> <p>Were studies identified that were excluded & did they give reasons why (i.e., which criteria they failed to include)?</p> | |
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| Are the results of this SR valid? | |
|---|---|
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| <p>Is this a SR of randomized controlled trials? Did they limit this to high quality studies at the top of the hierarchies?</p> <p>If not, what types of studies were included?</p> <p>What are the potential consequences of including these studies for this review's results?</p> | <p>This is a meta-analysis of available case studies.</p> |
| <p>Did this study follow the Cochrane methods selection process and did it identify all relevant trials?</p> <p>If not, what are the consequences for this review's results?</p> | <p>Without following the Cochrane method there is concern for inclusion of poorly designed research articles with questionable methodologies.</p> |
| <p>Do the methods describe the processes and tools used to assess the quality of individual studies?</p> <p>If not, what are the consequences for this review's results?</p> | <p>No. There is concern for the inclusion of low quality articles.</p> |
| <p>What was the quality of the individual studies included?</p> <p>Were the results consistent from study to study?</p> <p>Did the investigations provide details about the research validity or quality of studies included in the review?</p> | <p>Studies included were grouped by relevance to the author's selected themes of surgical and non-surgical management of rotator cuff tears.</p> |
| <p>Did the investigators address publication bias?</p> | <p>No publication bias was addressed.</p> |

| Are the valid results of this SR important? | |
|--|---|
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| <p>Were the results homogenous from study to study?</p> | <p>It is unclear as study demographics were not represented in the article.</p> |

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| If not, what are the consequences for this review's results? | |
| If the paper is a meta-analysis, did they report the statistical results? Did they include a forest plot? What other statistics do they include? Are these Cis? | |
| From the findings, is it apparent what the cumulative weight of the evidence is? | In surgical management there is a growing amount of research pointing to the use of arthroscopic repairs and double row suturing being superior to open and mini-open repairs. There is no specific superiority in the use of non-surgical treatments. |

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| Can you apply this valid, important evidence from this SR in caring for your patient/client? What is the external validity? | |
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| Is your patient different from those in this SR? | Unclear, though the article does discuss the variation that can arise in the older adult. |
| Is the treatment feasible in your setting? Do you have the facilities, skill set, time, 3rd party coverage to provide this treatment? | Conservative exercise therapy can be performed in my setting and I have the skill set to provide the treatment. |
| Does the intervention fit within your patient/client's stated values or expectations? If not, what will you do now? | The non-surgical options fit within my patient's values. |

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| What is the Bottom line? | |
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| Summarize your findings and relate this back to clinical significance. | Surgical revisions for failed primary are inferior to successful primary repairs. Arthroscopic repairs show superiority to open and mini-open repairs. Though inconclusive for success, exercise therapy shows itself to be inexpensive and can provide a base line for later surgical repairs and post-surgical Physical therapy. |

Reference 3:

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Citation: Huisstede, B. M., Koes, B. W., Gebremariam, L., Keijsers, E., & Verhaar, J. A. (2011). Current evidence for effectiveness of interventions to treat rotator cuff tears. *Manual Therapy, 16*(3), 217-230. doi:10.1016/j.math.2010.10.012

Level of Evidence (Oxford Scalre): 1b

Pedro Score:

| Does the design follow the Cochrane Method? | |
|--|--|
| Appraisal Criterion | Reader's Comments |
| <p>Formulating the Question: Do the authors identify the focus of the review? A clearly defined question should specify the types of: people (participants), interventions or exposures, outcomes that are of interest, studies that are relevant to answering the question.</p> | <p>The purpose and focus of the article was clearly described and presented, the assessment of effectiveness of non-surgical and (post)surgical interventions for symptomatic rotator cuff tears.</p> |
| <p>Locating Studies: Did they include multiple databases? Was the search strategy defined and include bibliographic databases used as well as a hand searching terms (Keywords and index terms)? Citation searching: reference lists? Contact with 'experts' or identify 'grey' literature (body of materials that cannot be found easily through conventional channels such as publishers)? Sources for 'grey' literature?</p> | <p>The Cochrane library, PubMed, Embase, CINAHL and Pedro databases were searched. All databases were limited by articles from 2010 forward with keywords related to the disorder "rotator cuff tear" and "supraspinatus tear" and interventions were included in the search. Further search strategy is available upon request.</p> |
| <p>Critical Appraisal for Inclusion: Were criteria for selection specified? Did more than one author assess the relevance of each report? Were decisions concerning relevance of each report? Were decisions concerning relevance described completed by non-experts, or both? Did the people assessing the relevance of studies know the names of the authors, institutions, journals of publication and results when they apply the inclusion criteria?</p> | <p>Two reviews independently applied the inclusion criteria, a consensus method used to solve disagreements. Inclusion criteria A – Patients with rotator cuff tears B – Tear was NOT caused by acute trauma or systemic disease C – An intervention for treating the disorder was evaluated. D – Results on pain, function or recovery with a follow-up of at least 2 weeks. E – Written in English, French, German or Dutch.</p> |
| <p>Collection of the Data:</p> | <p>Collection data is included and the coding is easy to follow.</p> |

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| <p>Was the collection data used and is it included?</p> <p>Are the studies coded and is the data coding easy to follow?</p> <p>Were studies identified that were excluded & did they give reasons why (i.e., which criteria they failed to include)?</p> | <p>Excluded studies were those that compared analgesics in rotator cuff tear surgeries.</p> |
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| Are the results of this SR valid? | |
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| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| <p>Is this a SR of randomized controlled trials? Did they limit this to high quality studies at the top of the hierarchies?</p> <p>If not, what types of studies were included?</p> <p>What are the potential consequences of including these studies for this review's results?</p> | <p>This SR included both high and low quality (Oxford score 4 comparable) studies.</p> |
| <p>Did this study follow the Cochrane methods selection process and did it identify all relevant trials?</p> <p>If not, what are the consequences for this review's results?</p> | <p>The Cochrane method was followed and all relevant trials were identified.</p> |
| <p>Do the methods describe the processes and tools used to assess the quality of individual studies?</p> <p>If not, what are the consequences for this review's results?</p> | <p>Quantitative analysis was not possible as the authors report heterogeneity in the outcome measures used.</p> |
| <p>What was the quality of the individual studies included?</p> <p>Were the results consistent from study to study?</p> <p>Did the investigations provide details about the research validity or quality of studies included in the review?</p> | <p>A methodological quality analysis was performed and a table created to display the authors' findings.</p> <p>Of the RCT's included, evidence was considered;</p> <p>Strong if= Consistent positive findings within multiple high-quality RCTs</p> <p>Moderate if= Consistent findings within multiple low-quality RCTs and/or one high-quality RCT.</p> <p>Limited if= Positive findings within one low-quality RCT</p> <p>Conflicting if= Provided by conflicting (Significant) findings in the RCTs</p> |

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| | No Evidence if= RCTs available but no significant difference between intervention and control groups reported. No systematic review or RCT found. |
| Did the investigators address publication bias? | |

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| Are the valid results of this SR important? | |
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| Were the results homogenous from study to study? If not, what are the consequences for this review's results? | No, differences in Outcome measures used in the different RCTs included in the review. For the sake of this review the heterogeneity of outcomes measures may actually reduce the significance of findings as the populations can not be pooled. |
| If the paper is a meta-analysis, did they report the statistical results? Did they include a forest plot? What other statistics do they include? Are these Cis? | |
| From the findings, is it apparent what the cumulative weight of the evidence is? | A large number low quality RCT's with low n state that surgical interventions have significantly better outcomes than non-surgical interventions. |

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| Can you apply this valid, important evidence from this SR in caring for your patient/client? What is the external validity? | |
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| Is your patient different from those in this SR? | The populations within the RCT's included people between the ages of 26 and 72. |
| Is the treatment feasible in your setting? Do you have the facilities, skill set, time, 3rd party coverage to provide this treatment? | The non-surgical exercise therapy is feasible in my setting and I have the skill set for its application. |
| Does the intervention fit within your patient/client's stated values or expectations? If not, what will you do now? | Yes |

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|-----------------------------------|---------------------------------|
| What is the Bottom line? | |
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |

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| Summarize your findings and relate this back to clinical significance. | While there is statistically significant evidence for the superiority of surgical interventions versus non-surgical interventions there is an unclear clinical significance of these findings. Higher n's and homogenous outcome measures to allow for population pooling would provide stronger evidence for one or the other. |
|---|---|

Reference 4:

Citation: Kuhn, J. E., Dunn, W. R., Sanders, R., An, Q., Baumgarten, K. M., Bishop, J. Y., . . . Wright, R. W. (2013). Effectiveness of physical therapy in treating atraumatic full-thickness rotator cuff tears: a multicenter prospective cohort study. *Journal of Shoulder and Elbow Surgery*, 22(10), 1371-1379. doi:10.1016/j.jse.2013.01.026

Level of Evidence (Oxford Scale): 4

Pedro Score:

| Is the purpose and background information sufficient? | |
|--|---|
| Appraisal Criterion | Reader's Comments |
| <p>Study Purpose Stated clearly: Usually stated briefly in abstract and in greater detail in introduction. May be phrased as a question or hypothesis. A clear statement helps you determine if topic is important, relevant and of interest to you. Consider how the study can be applied to PT and/or your own situation What is the purpose of this study?</p> | <p>A multicenter prospective cohort study to determine the effectiveness of this rehabilitation protocol in treating patients with atraumatic rotator cuff tears, with failure defined as patients electing to have surgery and to determine the effect of this nonoperative physical therapy protocol on patient-reported measures of outcome.</p> |
| <p>Literature Relevant background presented? A review of the literature should provide background for the study by synthesizing relevant information such as previous research and gaps in current knowledge, along with the clinical importance of the topic. Describe the justification of the need for this study.</p> | <p>A systematic review of the literature was performed to evaluate postoperative rotator cuff repair rehabilitation with no clearly defined standards to indicate a need for surgery the prospective cohort study was conducted.</p> |

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| Does the research design have internal validity? | |
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| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| <ul style="list-style-type: none"> • Discuss possible threats to internal validity in the research design. Include: • Assignment • Attrition • History • Instrumentation • Maturation • Testing • Compensatory Rivalry • Statistical Regression | Orthopedic surgery facilities across the US. No placebo group was employed and all patients were treated. Initially 422 individuals were included and data was collected for a minimum of 3 months with the 2 year follow up containing 90% of the original cohort (381). |

| Are the results of this therapeutic trial valid? | |
|--|---|
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| <p>Did the investigators Randomly assign subjects to treatment groups? If not, describe what was done What are the potential consequences of this assignment process for the study's results?</p> | All patients were treated and no placebo group was used or assigned. Patients were compared to their initial evaluation 'baseline'. |
| <p>Were the groups similar at the start of the trial? Did they report the demographics of the study groups? If they were not similar – what differences existed?</p> | The demographics of the study group were reported. |
| <p>Did the subjects know which treatment group they were assigned? If yes, what are the potential consequences of the subjects' knowledge for this study's results?</p> | All patients were part of the treatment group. |
| <p>Were the groups managed equally, apart from the actual experimental treatment? If not, what are the potential consequences of this knowledge for the study's results?</p> | Yes. |
| <p>Was the subject follow-up time sufficiently long to answer the question(s) posed by the research?</p> | 6 weeks, 12 weeks, 6 months, 1 year and 2 year follow ups were performed providing information on duration of effects. |

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| If not, what are the potential consequences of this knowledge for the study's results? | |
| Did all the subjects originally enrolled complete the study? If not, how many subjects were lost? What, if anything, did the authors do about this attrition? What are the implications of the attrition and the way it was handled with respect to the study's findings? | 90% of the original 422 (381) individuals enrolled completed the 2 year follow up. |
| Were all patients analyzed in the groups to which they were randomized (i.e. was there an intention to treat analysis)? If not, what did the authors do with the data from these subjects? If the data were excluded, what are the potential consequences for this study's results? | Yes. |

| Are the valid results of this RCT important? | |
|--|---|
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| What were the statistical findings of this study? When appropriate, use the calculation forms below to determine these values Include: Tests of differences? With p-values and CI. Include effect size with p-values and CI Include: ARR/ABI and RRR/RBI with p-values and CI Include: NNT and CI | |
| What is the meaning of these statistical findings for your patient/client's case? What does this mean to your practice? | These findings suggest that a non-surgical option is both viable and available for my patient. |
| Do these findings exceed a minimally important difference? If not, will you still use this evidence? | With an increase in range of motion of more than 10 degrees these findings exceed a minimally important difference. |

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| Can you apply this valid, important evidence about and intervention in caring for your patient/client? What is the external validity? | |
|---|---|
| Appraisal Criterion | Reader's Comments |
| Does this intervention sound appropriate for use (available/affordable) in your clinical setting? | Yes, both available and affordable in my clinical setting. |
| Are the study subjects similar to your patient/client? If not, how different? Can you use this intervention in spite of the differences? | The mean average for individuals in this study were 62, within a few years of my patient. |
| Does the potential benefits outweigh the potential risks using this intervention with your patient/client? | The predominant benefit of improved overhead reach, both flexion and abduction outweigh the potential risk of producing a symptomatic response. |
| Does the intervention fit within your patient/client's stated values or expectations? If not, what will you do now? | As a none surgical option, this intervention fits within my patient's values. |
| Are there any threats to external validity in this study? | No. This study was performed on a wide variety of individuals spread over a wide geographical range. |

Reference 5:

Citation: Kukkonen, J., Joukainen, A., Lehtinen, J., Mattila, K. T., Tuominen, E. K., Kauko, T., & Äärimaa, V. (2015). Treatment of nontraumatic rotator cuff tears. *The Journal of Bone and Joint Surgery*, 97(21), 1729-1737. doi:10.2106/jbjs.n.01051

Level of Evidence (Oxford Scale): 1b**Pedro Score:**

| Is the purpose and background information sufficient? | |
|---|--|
| Appraisal Criterion | Reader's Comments |
| Study Purpose Stated clearly: Usually stated briefly in abstract and in greater detail in introduction. May be phrased as a question or hypothesis. A clear statement helps you determine if topic is important, relevant and of interest to you. | A RCT to compare physiotherapy; acromioplasty and physiotherapy; and rotator cuff repair, acromioplasty, and physiotherapy in the treatment of symptomatic, nontraumatic, rotator cuff tears among patients older than 55 with a 2 year follow up. |

ROTATOR CUFF TEAR OUTCOMES, SURGICAL VS NON-SURGICAL INTERVENTIONS.

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| Consider how the study can be applied to PT and/or your own situation What is the purpose of this study? | |
| Literature Relevant background presented? A review of the literature should provide background for the study by synthesizing relevant information such as previous research and gaps in current knowledge, along with the clinical importance of the topic. Describe the justification of the need for this study. | No formal review of the background literature was presented though multiple references are used throughout the article. |

| Does the research design have internal validity? | |
|---|--|
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| <ul style="list-style-type: none"> • Discuss possible threats to internal validity in the research design. Include: • Assignment • Attrition • History • Instrumentation • Maturation • Testing • Compensatory Rivalry • Statistical Regression | By the authors, the study nurse randomized patients into groups using sequentially numbered, opaque, sealed envelopes. Randomization was stratified by participating hospital. |

| Are the results of this therapeutic trial valid? | |
|---|--|
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| Did the investigators Randomly assign subjects to treatment groups? If not, describe what was done What are the potential consequences of this assignment process for the study's results? | Yes, and randomization was not performed by the authors. |
| Were the groups similar at the start of the trial? Did they report the demographics of the study groups? If they were not similar – what differences existed? | All included patients had symptomatic shoulders with confirmed (by MRI) tears. Sex, age, affected side, working status, duration of symptoms, smoking or non-smoker, and prior corticosteroid injections. All groups were similar at the start of the trial. |

ROTATOR CUFF TEAR OUTCOMES, SURGICAL VS NON-SURGICAL INTERVENTIONS.

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| <p>Did the subjects know which treatment group they were assigned? If yes, what are the potential consequences of the subjects' knowledge for this study's results?</p> | <p>Prior to assignment all patients were informed of the three groups and the interventions being tested. Due to the nature of symptomatic rotator cuff tears all patient's received intervention.</p> |
| <p>Were the groups managed equally, apart from the actual experimental treatment? If not, what are the potential consequences of this knowledge for the study's results?</p> | <p>All three groups were managed equally.</p> |
| <p>Was the subject follow-up time sufficiently long to answer the question(s) posed by the research? If not, what are the potential consequences of this knowledge for the study's results?</p> | <p>Follow up was performed at 3, 6, 12 and 24 months.</p> |
| <p>Did all the subjects originally enrolled complete the study? If not, how many subjects were lost? What, if anything, did the authors do about this attrition? What are the implications of the attrition and the way it was handled with respect to the study's findings?</p> | <p>9 individuals did not complete the study with 2 from the surgical treatment group having a partial tear at 'second-look' MRI, 5 individuals withdrawing and 1 passing away from unrelated disease. An "intent to treat" analysis was performed.</p> |
| <p>Were all patients analyzed in the groups to which they were randomized (i.e. was there an intention to treat analysis)? If not, what did the authors do with the data from these subjects? If the data were excluded, what are the potential consequences for this study's results?</p> | <p>Yes. For those individuals that withdrew there was an intent to treat analysis performed.</p> |

| Are the valid results of this RCT important? | |
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| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| <p>What were the statistical findings of this study? When appropriate, use the calculation forms below to determine these values Include: Tests of differences? With p-values and CI.</p> | <p>Constant score (Baseline; p=0.77. 2-year follow up; p=0.38, 95%) Pain (p=0.01, 95%) & VAS (<0.01, 95%) were significantly lower in Group 1 (PT group) at the 2-year mark. Cost of Treatment; mean cost for; group 1=5104, group 2=6915, group 3=9185. (p=<0.01, 95%) Mean direct cost; Group</p> |

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| <p>Include effect size with p-values and CI</p> <p>Include: ARR/ABI and RRR/RBI with p-values and CI</p> <p>Include: NNT and CI</p> | <p>1=2915, group 2=2434, group 3= 3674. (p=0.47, 95%)</p> <p>Mean societal cost; Group 1=2348, Group 2=4691, Groups 3=5646 (p<0.01, 95%)</p> |
| <p>What is the meaning of these statistical findings for your patient/client's case? What does this mean to your practice?</p> | <p>These statistics suggest that non-surgical treatment for rotator cuff tears of the supraspinatus muscle have a reasonable success at reduction of pain and have a lower overall cost.</p> |
| <p>Do these findings exceed a minimally important difference?</p> <p>If not, will you still use this evidence?</p> | <p>For the outcome of pain the findings exceed a minimally important difference.</p> |

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| <p>Can you apply this valid, important evidence about and intervention in caring for your patient/client? What is the external validity?</p> | |
| <p><i>Appraisal Criterion</i></p> | <p><i>Reader's Comments</i></p> |
| <p>Does this intervention sound appropriate for use (available/affordable) in your clinical setting?</p> | <p>The physical therapy intervention is both available and affordable for my clinical setting.</p> |
| <p>Are the study subjects similar to your patient/client?</p> <p>If not, how different? Can you use this intervention in spite of the differences?</p> | <p>All patients in the study were older than 55 years of age which are similar to my patient.</p> |
| <p>Does the potential benefits outweigh the potential risks using this intervention with your patient/client?</p> | <p>The presentation of pain reduction in the physical therapy group outweighs the possible tear progression, my patient had a full thickness tear.</p> |
| <p>Does the intervention fit within your patient/client's stated values or expectations?</p> <p>If not, what will you do now?</p> | <p>As a non-surgical option, this intervention fits within my patient's stated values.</p> |
| <p>Are there any threats to external validity in this study?</p> | <p>This study was performed in Finland, limiting the generality of this studies outcomes.</p> |

Reference 6:

Citation: Lee, W. H., Do, H. K., Lee, J. H., Kim, B. R., Noh, J. H., Choi, S. H., . . . Lim, J. (2016). Clinical outcomes of conservative treatment and arthroscopic repair of rotator cuff tears: A

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retrospective observational study. *Annals of Rehabilitation Medicine*, 40(2), 252.

doi:10.5535/arm.2016.40.2.252

Level of Evidence (Oxford Scale): 2b

Pedro Score:

| Is the purpose and background information sufficient? | |
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| Appraisal Criterion | Reader's Comments |
| <p>Study Purpose Stated clearly: Usually stated briefly in abstract and in greater detail in introduction. May be phrased as a question or hypothesis. A clear statement helps you determine if topic is important, relevant and of interest to you. Consider how the study can be applied to PT and/or your own situation What is the purpose of this study?</p> | <p>The aim of this retrospective study was to compare the clinical outcomes following conservative treatment and arthroscopic repair of a rotator cuff tear in patients >50 years old at middle and advanced age.</p> |
| <p>Literature Relevant background presented? A review of the literature should provide background for the study by synthesizing relevant information such as previous research and gaps in current knowledge, along with the clinical importance of the topic. Describe the justification of the need for this study.</p> | <p>Previous literature and research argued that conservative treatment didn't promote tendon health and could lead to progression of a rotator cuff tear's size while other studies showed 90% of patients recovered from a symptomatic rotator cuff tear without surgical repair. This research inconsistency prompted this study.</p> |

| Does the research design have internal validity? | |
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| Appraisal Criterion | Reader's Comments |
| <ul style="list-style-type: none"> • Discuss possible threats to internal validity in the research design. Include: • Assignment • Attrition • History • Instrumentation • Maturation • Testing • Compensatory Rivalry • Statistical Regression | |

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| Are the results of this therapeutic trial valid? | |
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| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| <p>Did the investigators Randomly assign subjects to treatment groups? If not, describe what was done What are the potential consequences of this assignment process for the study's results?</p> | <p>With those patients included, individuals were selected by inclusion criteria. The study is a retrospective.</p> |
| <p>Were the groups similar at the start of the trial? Did they report the demographics of the study groups? If they were not similar – what differences existed?</p> | <p>Group demographics were equivalent.</p> |
| <p>Did the subjects know which treatment group they were assigned? If yes, what are the potential consequences of the subjects' knowledge for this study's results?</p> | <p>As a retrospective study the individuals were previously treated prior to analysis.</p> |
| <p>Were the groups managed equally, apart from the actual experimental treatment? If not, what are the potential consequences of this knowledge for the study's results?</p> | <p>Analysis of the groups was performed equally with pain and ROM assessments calculated equally between groups.</p> |
| <p>Was the subject follow-up time sufficiently long to answer the question(s) posed by the research? If not, what are the potential consequences of this knowledge for the study's results?</p> | <p>Subject follow-up was performed at 2 months, 6 months and 1 year.</p> |
| <p>Did all the subjects originally enrolled complete the study? If not, how many subjects were lost? What, if anything, did the authors do about this attrition? What are the implications of the attrition and the way it was handled with respect to the study's findings?</p> | <p>As a retrospective study the individuals completed their course of treatment prior to the analysis of their information.</p> |
| <p>Were all patients analyzed in the groups to which they were randomized (i.e. was there an intention to treat analysis)? If not, what did the authors do with the data from these subjects?</p> | <p>All patients were analyzed and any missing information was gathered by phone interview.</p> |

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| If the data were excluded, what are the potential consequences for this study's results? | |
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| Are the valid results of this RCT important? | |
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| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| What were the statistical findings of this study? When appropriate, use the calculation forms below to determine these values Include: Tests of differences? With p-values and CI. Include effect size with p-values and CI Include: ARR/ABI and RRR/RBI with p-values and CI Include: NNT and CI | Significantly insignificant; At one year follow up; Pain (p=0.80, 95%) ROM [forward flexion] (p=0.88, 95%) ROM [internal rotation] (p=0.11, 95%) Aggravation of outcomes; Pain (p=0.40, 95%) ROM (Forward Flexion) (p=0.48, 95%) ROM (internal Rotation) (p=0.26, 95%) |
| What is the meaning of these statistical findings for your patient/client's case? What does this mean to your practice? | By this information there is no significant difference at 1 year post procedure between conservative treatment and arthroscopic rotator cuff repair. |
| Do these findings exceed a minimally important difference? If not, will you still use this evidence? | Within the chosen demographics of the individuals included these findings exceed a minimally important difference. |

| Can you apply this valid, important evidence about and intervention in caring for your patient/client? What is the external validity? | |
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| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| Does this intervention sound appropriate for use (available/affordable) in your clinical setting? | The conservative intervention of shoulder exercises, oral NSAIDs and corticosteroid injections is available and affordable. |
| Are the study subjects similar to your patient/client? If not, how different? Can you use this intervention in spite of the differences? | My patient matches the study's subject demographics in all aspects except for tear size. This study excluded full thickness (>3cm) tears. After her re-tear she fulfills all inclusion criteria. |
| Does the potential benefits outweigh the potential risks using this intervention with your patient/client? | Given the cost and time involved to see benefits from a rotator cuff surgery the benefits outweigh the potential risks. |

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| <p>Does the intervention fit within your patient/client's stated values or expectations? If not, what will you do now?</p> | <p>This intervention is a non-surgical option to rotator cuff pathology.</p> |
| <p>Are there any threats to external validity in this study?</p> | <p>For my patient the only threat to generalization is the lack of use of subjects who had a full thickness tear. In her re-tear state she matches and this information can be generalized.</p> |

Reference 7:

Citation: Moosmayer, S., Lund, G., Seljom, U. S., Haldorsen, B., Svege, I. C., Hennig, T., . . . Smith, H. (2014). Tendon repair compared with physiotherapy in the treatment of rotator cuff tears. *The Journal of Bone and Joint Surgery-American Volume*, 96(18), 1504-1514.
doi:10.2106/jbjs.m.01393

Level of Evidence (Oxford Scale): 1b**Pedro Score:**

| Is the purpose and background information sufficient? | |
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| Appraisal Criterion | Reader's Comments |
| <p>Study Purpose Stated clearly: Usually stated briefly in abstract and in greater detail in introduction. May be phrased as a question or hypothesis. A clear statement helps you determine if topic is important, relevant and of interest to you. Consider how the study can be applied to PT and/or your own situation What is the purpose of this study?</p> | <p>To compare treatment outcomes of primary tendon repair with those of a physiotherapy program, which included the possibility of crossing over to secondary tendon repair for patients with persistent symptoms. The one-year results of the same cohort were previously reported. The hypothesis was that a substantial number of patients in the physiotherapy group would have secondary tendon repair and that analysis by intention to treat would show comparable treatment benefits in the two groups.</p> |
| <p>Literature Relevant background presented? A review of the literature should provide background for the study by synthesizing relevant information such as previous research and gaps in current knowledge, along with the clinical importance of the topic.</p> | <p>By the authors examination of the research available, comparison studies are lacking between conservative non-surgical and surgical treatment for rotator cuff tears. Both treatment options have their side effects; surgical treatment has possible joint stiffness from immobilization, infection or non-healing of the site; non-surgical treatment leaves tears unrepaired and over</p> |

ROTATOR CUFF TEAR OUTCOMES, SURGICAL VS NON-SURGICAL INTERVENTIONS.

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| Describe the justification of the need for this study. | the natural course those tears, primarily repairable, may become unreparable. |
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| Does the research design have internal validity? | |
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| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| <ul style="list-style-type: none"> • Discuss possible threats to internal validity in the research design. Include: • Assignment • Attrition • History • Instrumentation • Maturation • Testing • Compensatory Rivalry • Statistical Regression | The study was performed in one Norwegian institute. One of the inclusion criteria was a positive impingement sign which, while being very sensitive it not very specific. |

| Are the results of this therapeutic trial valid? | |
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| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| <p>Did the investigators Randomly assign subjects to treatment groups? If not, describe what was done What are the potential consequences of this assignment process for the study's results?</p> | An external investigator generated the randomization (Block randomization) list prior to the study's start. |
| <p>Were the groups similar at the start of the trial? Did they report the demographics of the study groups? If they were not similar – what differences existed?</p> | The groups were similar at the start and demographic information was reported. |
| <p>Did the subjects know which treatment group they were assigned? If yes, what are the potential consequences of the subjects' knowledge for this study's results?</p> | Once allocated to a group the individuals were made away of the treatment they would receive. |
| <p>Were the groups managed equally, apart from the actual experimental treatment? If not, what are the potential consequences of this knowledge for the study's results?</p> | Other than applied treatment the two groups were managed equally. |

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| <p>Was the subject follow-up time sufficiently long to answer the question(s) posed by the research?</p> <p>If not, what are the potential consequences of this knowledge for the study's results?</p> | <p>Subject follow up was done at 6 months, 1 year, 2 years and 5 years.</p> |
| <p>Did all the subjects originally enrolled complete the study?</p> <p>If not, how many subjects were lost? What, if anything, did the authors do about this attrition? What are the implications of the attrition and the way it was handled with respect to the study's findings?</p> | <p>By the authors 98% of participants (100/103) were available for the 5-year follow-up.</p> |
| <p>Were all patients analyzed in the groups to which they were randomized (i.e. was there an intention to treat analysis)?</p> <p>If not, what did the authors do with the data from these subjects? If the data were excluded, what are the potential consequences for this study's results?</p> | <p>All subjects within groups were analyzed.</p> |

| Are the valid results of this RCT important? | |
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| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| <p>What were the statistical findings of this study?</p> <p>When appropriate, use the calculation forms below to determine these values</p> <p>Include: Tests of differences? With p-values and CI.</p> <p>Include effect size with p-values and CI</p> <p>Include: ARR/ABI and RRR/RBI with p-values and CI</p> <p>Include: NNT and CI</p> | <p>Significant findings from 6 months to 5 years; Constant score; (p=0.05, 95%)</p> <p>ASES [self-assessment portion] (p<0.001, 95%)</p> <p>VAS (p<0.001, 95%)</p> <p>Of the secondary outcomes the study looked at [Pain-free abduction, flexion, strength and the SF-36] none showed a significant difference over the follow up from 6 months to 5 years.</p> |
| <p>What is the meaning of these statistical findings for your patient/client's case? What does this mean to your practice?</p> | <p>The main outcomes measure Constant Score for conservative treatment vs surgical treatment (primary tendon repair) shows a significance difference when compared 6months to 5 years, but when compared over time there is no significance possibly owing</p> |

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| | to a steady increase in patient scoring over time. The other focus of this long-term study was to see how many of the conservative treatment group would cross over to the surgical group in the 5 years. While this was almost 25% of the physiotherapy group, the surgical group saw re-tears (8 with full thickness and 7 with partial thickness re-tears of the 64 in the surgical group) suggesting that time and age related anatomical changes may account for most of these. Still suggesting that conservative non-surgical treatment for Rotator cuff tears is comparable to surgical repair and treatment. |
| Do these findings exceed a minimally important difference? If not, will you still use this evidence? | While there is statistical significance between groups and over time the outcomes ultimately are not clinically significant in the long term. |

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| Can you apply this valid, important evidence about and intervention in caring for your patient/client? What is the external validity? | |
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| Does this intervention sound appropriate for use (available/affordable) in your clinical setting? | Conservative non-surgical treatments of physiotherapy are both available and affordable. |
| Are the study subjects similar to your patient/client? If not, how different? Can you use this intervention in spite of the differences? | Subject demographics match with my patient's demographics. |
| Does the potential benefits outweigh the potential risks using this intervention with your patient/client? | Though the outcome equivalencies are seen at 5 years, the lack of surgery and its cost outweigh the short-term rise in outcomes. |
| Does the intervention fit within your patient/client's stated values or expectations? If not, what will you do now? | The conservative treatment is non-surgical and so fits within my patient's values. |
| Are there any threats to external validity in this study? | The subjects for this study were Norwegian and no other ethnicities were included in the study, limiting the generalization of the outcomes. |

Reference 8:

Citation: Oh, L. S., Wolf, B. R., Hall, M. P., Levy, B. A., & Marx, R. G. (2007). Indications for rotator cuff repair. *Clinical Orthopaedics and Related Research*, 455, 52-63.

doi:10.1097/blo.0b013e31802fc175

Level of Evidence (Oxford Scale): 4

Pedro Score:

| Does the design follow the Cochrane Method? | |
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| Appraisal Criterion | Reader's Comments |
| <p>Formulating the Question: Do the authors identify the focus of the review? A clearly defined question should specify the types of: people (participants), interventions or exposures, outcomes that are of interest, studies that are relevant to answering the question.</p> | <p>A systematic review of available evidence to explore the multitude of factors that influence the decision for surgical repair of symptomatic, full thickness rotator cuff tears. Specific questions; How do demographic variables influence the outcomes of RCTs, operative and non-operative and shoulder any demographic criteria be used to indicate surgery. Does acuity (or chronicity) of RCT or timing of surgery affect treatment outcomes? How do radiographic and intraoperative findings affect treatment outcome and indications for surgery, to identify any prognostic factors that may predict outcome and be helpful in making future treatment decisions.</p> |
| <p>Locating Studies: Did they include multiple databases? Was the search strategy defined and include bibliographic databases used as well as a hand searching terms (Keywords and index terms)? Citation searching: reference lists? Contact with 'experts' or identify 'grey' literature (body of materials that cannot be found easily through conventional channels such as publishers)? Sources for 'grey' literature?</p> | <p>Literature retrieval was performed in Medline, EMBASE, CINAHL and Cochrane Central Registry of Controlled Trials. Keyword, mesh terms and subject headings associated with "full-thickness rotator cuff tear", "surgical indication", "operative indication", or "indication surgery" were used across databases. Reference lists were included.</p> |
| <p>Critical Appraisal for Inclusion: Were criteria for selection specified? Did more than one author assess the relevance of each report?</p> | <p>Inclusion criteria:</p> <ol style="list-style-type: none"> 1. Study limited to full-thickness rotator cuff tears 2. Discussed indications for surgery |

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| <p>Were decisions concerning relevance of each report? Were decisions concerning relevance described completed by non-experts, or both? Did the people assessing the relevance of studies know the names of the authors, institutions, journals of publication and results when they apply the inclusion criteria?</p> | <p>3. Contained clinical outcome data following either nonoperative treatment or operative intervention</p> <p>4. Outcome data limited to humans</p> <p>One individual performed this literature search and three authors independently reviewed the results and selected appropriate studies.</p> |
| <p>Collection of the Data: Was the collection data used and is it included? Are the studies coded and is the data coding easy to follow? Were studies identified that were excluded & did they give reasons why (i.e., which criteria they failed to include)?</p> | <p>The 50 articles analyzed were grouped by selected assessment. This data coding was easy to follow.</p> <p>Excluded articles were those limited to the discussion of radiographic criteria for or diagnosis of rotator cuff tear, comparison of surgical techniques or implants, animal studies, or histological analysis without clinical outcome data. Also excluded were articles limited to either partial thickness or massive rotator cuff tears and subacromial impingement without rotator cuff tear and articles not written in English.</p> |

| Are the results of this SR valid? | |
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| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| <p>Is this a SR of randomized controlled trials? Did they limit this to high quality studies at the top of the hierarchies? If not, what types of studies were included? What are the potential consequences of including these studies for this review's results?</p> | <p>Yes the SR included RCTs. Case and cohort studies (Level IV evidence) were selected and evaluated. There are a limited number of high level articles on the subject or comparisons involving rotator cuffs that are not surgical in nature.</p> |
| <p>Did this study follow the Cochrane methods selection process and did it identify all relevant trials? If not, what are the consequences for this review's results?</p> | <p>All articles that met the criteria for inclusion were identified for inclusion in this systematic review.</p> |
| <p>Do the methods describe the processes and tools used to assess the quality of individual studies?</p> | <p>No discussion is performed describing the processes and tools used to assess the study qualities other than indicated evidence level.</p> |

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| If not, what are the consequences for this review's results? | |
| What was the quality of the individual studies included? Were the results consistent from study to study? Did the investigations provide details about the research validity or quality of studies included in the review? | The quality of the individual studies was included and remarked on by the authors. The discussion specifically commenting on the lack of high quality (level I and II) prospective and RCTs performed to determine the appropriateness of surgical or nonsurgical interventions for symptomatic shoulders. |
| Did the investigators address publication bias? | No discussion of publication bias was addressed by the authors. |

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| Are the valid results of this SR important? | |
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| Were the results homogenous from study to study? If not, what are the consequences for this review's results? | Demographic homogeneity was not discussed by the authors and only sample size and follow-up duration were included in the article review. |
| If the paper is a meta-analysis, did they report the statistical results? Did they include a forest plot? What other statistics do they include? Are these Cis? | |
| From the findings, is it apparent what the cumulative weight of the evidence is? | The cumulative weight of the evidence indicates that more high-level studies need to be performed to specifically examine factors that influence the decision for surgical or non-surgical intervention of symptomatic full-thickness rotator cuff tears. |

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| Can you apply this valid, important evidence from this SR in caring for your patient/client? What is the external validity? | |
| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| Is your patient different from those in this SR? | My patient is similar to those included. |
| Is the treatment feasible in your setting? Do you have the facilities, skill set, time, 3rd party coverage to provide this treatment? | The non-operative physical therapy protocols discussed in the SR are feasible and available in an out-patient setting. |
| Does the intervention fit within your patient/client's stated values or expectations? | Mrs. J desired not to go through a second surgery. The non-surgical options to treat a |

ROTATOR CUFF TEAR OUTCOMES, SURGICAL VS NON-SURGICAL INTERVENTIONS.

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| If not, what will you do now? | symptomatic rotator cuff fit within her stated values. |
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| What is the Bottom line? | |
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| <i>Appraisal Criterion</i> | <i>Reader's Comments</i> |
| Summarize your findings and relate this back to clinical significance. | Currently there is limited (Level IV) evidence for the clinical decision to treat rotator cuff tears with surgical interventions or non-surgical interventions and that most of these decisions are based on a surgeon's discretion and low level (III and IV) evidence. Factors associated with poorer outcomes of either intervention are age (>70), gender (Women>Men) and pending Worker's compensation claims. |

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