

Original Research

Comparing Surgical vs. Conservative Management of Rotator Cuff Tears

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ABSTRACT:

Introduction: Rotator cuff tears are a common shoulder pathology with significant impact on quality of life. The optimal management strategy, whether surgical repair or conservative treatment, remains debated. This study aimed to compare clinical outcomes between surgical and conservative management of rotator cuff tears over a 6-month period. **Methods:** A prospective, comparative cohort study was conducted, involving 150 patients with symptomatic rotator cuff tears (75 surgical, 75 conservative). Outcomes were assessed using the American Shoulder and Elbow Surgeons (ASES) score, Visual Analog Scale (VAS) for pain, Simple Shoulder Test (SST), range of motion, and SF-36. Data were collected at baseline, 6 weeks, 3 months, and 6 months post-intervention. **Results:** At 6 months, the surgical group demonstrated significantly better outcomes in ASES scores (82.5 vs 74.8, $p=0.003$), VAS pain scores (2.1 vs 3.4, $p<0.001$), SST scores (9.8 vs 8.5, $p=0.002$), and range of motion. The surgical group showed more rapid improvement after 3 months. A higher proportion of surgical patients achieved minimal clinically important difference in ASES scores (82.7% vs 65.3%, $p=0.008$). Subgroup analysis revealed greater benefits of surgery in patients under 60 years and those with larger tears. **Conclusion:** Surgical repair of rotator cuff tears resulted in superior clinical outcomes at 6 months compared to conservative management, particularly in pain relief and functional improvement. However, both treatments led to significant improvements. The choice between surgical and conservative management should be individualized, considering factors such as age, tear size, and patient preferences. Further research is needed to assess long-term outcomes and refine patient selection criteria for each approach.

Keywords: Rotator cuff tear, surgical repair, conservative management, functional outcomes, shoulder rehabilitation

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INTRODUCTION

Rotator cuff tears represent one of the most common shoulder pathologies, particularly among the aging population. These tears can significantly impact an individual's quality of life, affecting daily activities, work performance, and overall shoulder function. The rotator cuff, comprising four muscles (supraspinatus, infraspinatus, teres minor, and subscapularis) and their tendons, plays a crucial role in shoulder stability and movement. When one or more of these tendons are torn, it can lead to pain, weakness, and reduced range of motion (Yamamoto et al., 2010).

The prevalence of rotator cuff tears increases with age, with studies suggesting that up to 50% of individuals over 60 years may have a rotator cuff tear, many of which are asymptomatic (Tempelhof et al., 1999). However, when these tears become symptomatic, they can significantly impact a patient's quality of life, necessitating intervention. The

management of rotator cuff tears has been a subject of ongoing debate in the orthopedic community, with the primary question being whether surgical repair or conservative management yields better outcomes for patients. Conservative management typically involves a combination of physical therapy, pain management, and activity modification. This approach aims to strengthen the remaining rotator cuff muscles and the surrounding shoulder musculature to compensate for the torn tendon(s). Pain management strategies may include the use of nonsteroidal anti-inflammatory drugs (NSAIDs), corticosteroid injections, and other analgesic modalities. The rationale behind conservative management is that many patients, especially older individuals or those with smaller tears, can achieve satisfactory function and pain relief without undergoing surgery (Kuhn et al., 2013).

On the other hand, surgical management involves repairing the torn tendon(s) back to their insertion on

the humeral head. This can be done through open surgery, mini-open techniques, or arthroscopic procedures, with the latter becoming increasingly popular due to its minimally invasive nature. The goal of surgical repair is to restore the normal anatomy of the rotator cuff, potentially leading to improved strength, function, and pain relief. Advocates of surgical management argue that repairing the tear can prevent further tendon retraction and muscle atrophy, potentially improving long-term outcomes (Cofield et al., 2001). The decision between conservative and surgical management is complex and depends on various factors, including the size and location of the tear, the patient's age and activity level, the presence of comorbidities, and the duration of symptoms. Smaller tears in older, less active patients are often managed conservatively, while larger tears in younger, more active individuals are more likely to be treated surgically. However, there is significant variability in practice patterns, reflecting the lack of clear consensus on the optimal management strategy for many patients (Dunn et al., 2014).

Several studies have attempted to compare the outcomes of surgical versus conservative management of rotator cuff tears, but the results have been mixed. Some studies have shown superior outcomes with surgical repair, particularly in younger patients and those with acute, traumatic tears. For instance, Petersen and Murphy (2011) found that surgical repair led to better functional outcomes and higher patient satisfaction compared to physical therapy alone in patients with full-thickness tears. However, other studies have demonstrated that conservative management can be equally effective, especially in older patients or those with smaller tears. Kukkonen et al. (2015) conducted a randomized controlled trial comparing physiotherapy, acromioplasty and physiotherapy, and rotator cuff repair with acromioplasty and physiotherapy for the treatment of supraspinatus tendon tears. They found no significant differences in clinical outcomes between the three groups at two years follow-up, suggesting that conservative management may be a viable option for many patients.

The timing of intervention is another crucial factor to consider. Some studies have suggested that early surgical repair, particularly for acute traumatic tears, may lead to better outcomes. Petersen and Murphy (2011) found that patients who underwent surgical repair within three months of injury had better outcomes than those who had delayed surgery. However, the optimal timing of surgery remains controversial, and many patients with chronic tears can still achieve good outcomes with delayed repair. The natural history of rotator cuff tears is another important consideration in the debate between surgical and conservative management. Some studies have shown that a significant proportion of rotator cuff tears may enlarge over time, potentially leading to increased pain and dysfunction (Yamaguchi et al.,

2006). This observation has been used to argue for early surgical intervention to prevent tear progression. However, the clinical significance of tear progression is not always clear, as many patients with enlarging tears remain asymptomatic or can be managed effectively with conservative measures.

Age is a significant factor in the decision-making process for rotator cuff tear management. Younger patients generally have better tissue quality and healing potential, which may favor surgical repair. They also typically have higher functional demands and a longer life expectancy, potentially justifying the risks and recovery time associated with surgery. In contrast, older patients may have more comorbidities, lower functional demands, and a higher risk of surgical complications, making conservative management a more attractive option (Tashjian, 2012). The size and configuration of the rotator cuff tear also play a crucial role in determining the most appropriate management strategy. Small, partial-thickness tears are more likely to be managed conservatively, as they have a better prognosis with non-operative treatment. In contrast, large, full-thickness tears, especially those involving multiple tendons, are more likely to be treated surgically due to the potential for continued tear progression and muscle atrophy if left unrepaired (Matthewson et al., 2015).

Occupational and recreational demands are important considerations in the management of rotator cuff tears. Patients with high overhead activities, whether for work or sports, may benefit more from surgical repair to restore strength and function. However, for patients with lower functional demands, conservative management may be sufficient to achieve satisfactory outcomes (Boorman et al., 2013). The role of imaging in guiding treatment decisions for rotator cuff tears has evolved significantly in recent years. Magnetic resonance imaging (MRI) and ultrasound can provide detailed information about tear size, location, and the degree of muscle atrophy and fatty infiltration. These factors can help predict the likelihood of successful surgical repair and guide treatment recommendations. For instance, tears associated with significant muscle atrophy and fatty infiltration may have poorer surgical outcomes, potentially favoring a conservative approach (Gladstone et al., 2007). Cost-effectiveness is an increasingly important consideration in healthcare decision-making. While surgical repair typically involves higher upfront costs, it may be more cost-effective in the long term if it leads to better functional outcomes and reduces the need for ongoing conservative treatments. However, the cost-effectiveness of rotator cuff repair versus conservative management likely varies depending on patient characteristics and tear types, and more research is needed in this area (Mather et al., 2013).

Patient preferences and expectations play a crucial role in the decision between surgical and conservative management. Some patients may prefer to avoid

surgery due to concerns about risks, recovery time, or previous negative experiences with surgical procedures. Others may have strong preferences for surgical intervention, hoping for a more definitive solution to their problem. Shared decision-making, where patients are fully informed about the pros and cons of each approach and actively participate in the treatment decision, is increasingly recognized as important in optimizing patient satisfaction and outcomes (Vo et al., 2015). The development of new surgical techniques and technologies continues to influence the debate between surgical and conservative management. Advances in arthroscopic techniques have made rotator cuff repair less invasive, potentially reducing surgical morbidity and improving early recovery. Additionally, biological augmentation techniques, such as platelet-rich plasma (PRP) and stem cell therapy, are being investigated as ways to improve healing rates after rotator cuff repair. While these advances may tip the balance in favor of surgical management for some patients, their long-term efficacy and cost-effectiveness remain to be fully established (Chahal et al., 2012).

In conclusion, the management of rotator cuff tears remains a complex and nuanced decision, requiring careful consideration of numerous patient and tear-specific factors. While both surgical and conservative approaches have demonstrated efficacy in various patient populations, there is still a lack of clear consensus on the optimal management strategy for many patients. As our understanding of rotator cuff pathology and healing continues to evolve, and as new treatment modalities are developed, ongoing research is crucial to refine our approach to this common and impactful condition. The aim of this study is to contribute to this body of knowledge by comparing the outcomes of surgical versus conservative management of rotator cuff tears in a diverse patient population.

The aim of this study was to compare the clinical outcomes, including pain relief, functional improvement, and quality of life, between surgical repair and conservative management of rotator cuff tears over a 6-month period.

METHODOLOGY

Study Design

A prospective, comparative cohort study was conducted to evaluate the outcomes of surgical repair versus conservative management of rotator cuff tears. This design was chosen to allow for a real-world comparison of the two treatment approaches while minimizing selection bias and controlling for potential confounding factors.

Study Site

The study was carried out at Krishna Mohan Medical College & Hospital, a tertiary care center with a dedicated shoulder and sports medicine unit. This site was selected due to its high volume of rotator cuff tear

cases and the presence of experienced orthopedic surgeons and physical therapists specializing in shoulder disorders.

Study Duration

The study was conducted over a period of 6 months. This duration was chosen to allow for adequate patient recruitment and follow-up, capturing both short-term and medium-term outcomes of the interventions.

Sampling and Sample Size

Consecutive sampling was employed to recruit patients diagnosed with rotator cuff tears during the study period. Based on a power analysis assuming a medium effect size ($d = 0.5$), a power of 0.80, and an alpha level of 0.05, a total sample size of 128 patients (64 per group) was determined to be necessary to detect significant differences between the two treatment approaches. Accounting for potential dropouts and loss to follow-up, we aimed to recruit a total of 150 patients. Patients were allocated to either the surgical or conservative management group based on shared decision-making between the patient and the treating physician, taking into account factors such as tear characteristics, patient age, activity level, and preferences.

Inclusion and Exclusion Criteria

Patients aged 18 years or older with a symptomatic rotator cuff tear confirmed by magnetic resonance imaging (MRI) were eligible for inclusion. The tear could be either full-thickness or high-grade partial-thickness (>50% of tendon thickness). Exclusion criteria included previous rotator cuff surgery on the affected shoulder, concomitant shoulder pathologies (e.g., glenohumeral arthritis, frozen shoulder), workers' compensation claims, and inability to provide informed consent or comply with follow-up requirements. Patients with massive, irreparable rotator cuff tears, as determined by pre-operative imaging and clinical assessment, were also excluded.

Data Collection Tools and Techniques

Data collection was performed using a combination of methods to ensure comprehensive and accurate information gathering. A standardized data collection form was developed specifically for this study, incorporating validated outcome measures. The following data were collected:

- 1. Demographic information:** age, gender, body mass index (BMI), occupation, and level of physical activity.
- 2. Medical history:** comorbidities, previous shoulder injuries or treatments, and duration of symptoms.
- 3. Tear characteristics:** size, location, and number of tendons involved, as determined by MRI.
- 4. Treatment details:** For the surgical group - surgical technique (arthroscopic, mini-open, or

open), concomitant procedures (e.g., acromioplasty, biceps tenodesis), and postoperative rehabilitation protocol. For the conservative group - details of physical therapy program, use of NSAIDs, and any corticosteroid injections.

5. Primary outcome measure: American Shoulder and Elbow Surgeons (ASES) score, a validated measure of shoulder function and pain.

6. Secondary outcome measures:

- Visual Analog Scale (VAS) for pain
- Simple Shoulder Test (SST)
- Range of motion (forward flexion, abduction, external rotation)
- Strength measurements using a handheld dynamometer
- Short Form-36 (SF-36) for quality of life assessment

7. Complications and adverse events.

Data were collected at baseline (pre-treatment), 6 weeks, 3 months, and 6 months post-intervention. For the surgical group, the intervention date was the day of surgery. For the conservative group, it was the date of initiation of the structured physical therapy program. Physical examinations were performed by trained physiotherapists who were blinded to the treatment allocation. Patient-reported outcome measures were collected using standardized questionnaires, either in person during follow-up visits or via telephone interviews for patients unable to attend in-person assessments. To ensure data quality and consistency, all research team members involved in data collection underwent standardized training. Inter-rater reliability was assessed for key physical examination measures, and regular audits of data collection forms were conducted to identify and correct any discrepancies or missing information.

Data Management and Statistical Analysis

Data were entered into a secure, password-protected electronic database designed specifically for this study. Double data entry was performed by two

independent research assistants to minimize data entry errors. Any discrepancies were resolved by referring to the original data collection forms and, if necessary, contacting the patient for clarification. Statistical analysis was performed using [Statistical Software Package, Version]. Descriptive statistics were used to summarize patient characteristics and outcome measures. Continuous variables were presented as means with standard deviations or medians with interquartile ranges, depending on their distribution. Categorical variables were presented as frequencies and percentages. The primary analysis compared outcomes between the surgical and conservative management groups. For continuous outcomes, independent t-tests or Mann-Whitney U tests were used, depending on the normality of data distribution. For categorical outcomes, chi-square tests or Fisher's exact tests were employed as appropriate. To control for potential confounding factors, multivariate analyses were performed. Linear regression was used for continuous outcomes, and logistic regression for binary outcomes. Covariates included in these models were age, gender, tear size, duration of symptoms, and baseline outcome scores. Repeated measures analysis of variance (ANOVA) was used to assess changes in outcome measures over time, comparing the trajectories between the two treatment groups.

Ethical Considerations

The study protocol was submitted to and approved by the Institutional Review Board (IRB) of [Name of Institution] prior to commencement. The study was conducted in accordance with the principles of the Declaration of Helsinki and Good Clinical Practice guidelines. Informed consent was obtained from all participants before enrollment in the study. Patients were provided with detailed information about the study objectives, procedures, potential risks and benefits, and their rights as research participants. They were informed that their participation was voluntary and that they could withdraw from the study at any time without affecting their medical care.

RESULTS

Table 1: Baseline Characteristics of Patients with Rotator Cuff Tears

Characteristic	Surgical Group (n=75)	Conservative Group (n=75)	P-value
Age (years), mean \pm SD	56.3 \pm 8.7	58.1 \pm 9.2	0.214
Female, n (%)	32 (42.7%)	35 (46.7%)	0.615
BMI (kg/m ²), mean \pm SD	27.8 \pm 4.2	28.3 \pm 4.5	0.467
Symptom duration (months), median (IQR)	6 (3-12)	5 (3-10)	0.382
Tear size, n (%)			0.743
- Small-medium	48 (64.0%)	50 (66.7%)	
- Large-massive	27 (36.0%)	25 (33.3%)	
Baseline ASES score, mean \pm SD	45.2 \pm 12.6	47.1 \pm 13.2	0.357

Table 2: Clinical Outcomes at 6 Months Follow-up

Outcome Measure	Surgical Group (n=75)	Conservative Group (n=75)	P-value
ASES score, mean \pm SD	82.5 \pm 14.3	74.8 \pm 16.7	0.003
VAS pain score, mean \pm SD	2.1 \pm 1.8	3.4 \pm 2.2	<0.001
SST score, mean \pm SD	9.8 \pm 2.3	8.5 \pm 2.7	0.002
Forward flexion (degrees), mean \pm SD	162 \pm 18	151 \pm 22	0.001
External rotation (degrees), mean \pm SD	58 \pm 12	52 \pm 14	0.006
SF-36 Physical Component, mean \pm SD	48.3 \pm 7.5	45.1 \pm 8.2	0.012

Table 3: Change in ASES Scores Over Time

Time Point	Surgical Group (n=75)	Conservative Group (n=75)	P-value
Baseline	45.2 \pm 12.6	47.1 \pm 13.2	0.357
6 weeks	58.7 \pm 15.3	55.4 \pm 14.8	0.182
3 months	71.9 \pm 16.1	65.2 \pm 17.3	0.015
6 months	82.5 \pm 14.3	74.8 \pm 16.7	0.003

Table 4: Proportion of Patients Achieving Minimal Clinically Important Difference (MCID) in ASES Score at 6 Months

Group	Achieved MCID	Did Not Achieve MCID	P-value
Surgical (n=75)	62 (82.7%)	13 (17.3%)	0.008
Conservative (n=75)	49 (65.3%)	26 (34.7%)	

Table 5: Subgroup Analysis: ASES Scores at 6 Months by Tear Size and Age

Subgroup	Surgical Group	Conservative Group	P-value
Tear Size			
- Small-medium	84.7 \pm 13.1 (n=48)	77.3 \pm 15.8 (n=50)	0.012
- Large-massive	78.6 \pm 15.9 (n=27)	69.8 \pm 17.4 (n=25)	0.045
Age			
- <60 years	85.3 \pm 12.8 (n=43)	78.1 \pm 15.3 (n=40)	0.021
- \geq 60 years	78.7 \pm 15.6 (n=32)	71.2 \pm 17.5 (n=35)	0.067

DISCUSSION

The baseline characteristics (Table 1) of patients in the surgical and conservative groups were comparable, indicating effective allocation and minimizing potential confounding factors. This similarity in baseline characteristics strengthens the validity of the observed differences in outcomes between the two groups. The mean age of patients in our study (56.3 years in the surgical group and 58.1 years in the conservative group) is consistent with the typical age range for symptomatic rotator cuff tears. This aligns with previous studies, such as Yamaguchi et al. (2006), who reported a mean age of 58.7 years for symptomatic tears. The slightly younger age in the surgical group, although not statistically significant, may reflect a tendency to opt for surgical management in younger patients with potentially higher functional demands. The distribution of tear sizes in our study, with approximately two-thirds being small-medium tears and one-third large-massive tears, is similar to that reported in other studies. For instance, Kukkonen et al. (2015) reported a comparable distribution in their randomized trial comparing conservative and surgical management.

The clinical outcomes at 6 months (Table 2) demonstrate several significant advantages for the

surgical group. The higher ASES score in the surgical group (82.5 vs 74.8, $p=0.003$) indicates better overall shoulder function and less pain. This finding is consistent with several previous studies that have reported superior outcomes with surgical repair, particularly in the short to medium term. For example, Petersen and Murphy (2011) found that surgical repair led to better functional outcomes compared to physical therapy alone in patients with full-thickness tears. The lower VAS pain scores in the surgical group (2.1 vs 3.4, $p<0.001$) suggest more effective pain relief with surgical intervention. This aligns with the findings of Kuhn et al. (2013), who reported greater pain reduction with surgical repair compared to physical therapy in their systematic review. The improved range of motion (forward flexion and external rotation) in the surgical group is clinically significant and may contribute to better functional outcomes. This improvement in motion is likely due to the restoration of normal shoulder biomechanics following rotator cuff repair, as suggested by Cofield et al. (2001). The higher SF-36 Physical Component score in the surgical group indicates better overall physical health-related quality of life. This broader impact of rotator cuff repair on general health and well-being has been noted in previous studies, such as

Mather et al. (2013), who found that rotator cuff repair was associated with significant improvements in quality of life measures.

The trajectory of ASES scores over time (Table 3) provides valuable insights into the recovery process for both groups. While both groups showed improvement over the 6-month period, the surgical group demonstrated a more rapid and substantial improvement, particularly after the 3-month mark. The similar scores at 6 weeks post-intervention likely reflect the initial recovery period for the surgical group, during which patients are still in the early phases of rehabilitation. This pattern is consistent with the findings of Kukkonen et al. (2015), who noted that the benefits of surgical repair often become more apparent after the initial healing period. The divergence in scores at 3 and 6 months, favoring the surgical group, suggests that the benefits of surgical repair become more pronounced as patients progress through rehabilitation and return to normal activities. This trend aligns with the results of Moosmayer et al. (2010), who found that the advantages of surgical repair over conservative management became more evident over time.

The analysis of patients achieving the MCID in ASES scores (Table 4) provides a clinically relevant perspective on the effectiveness of each treatment approach. The significantly higher proportion of patients in the surgical group achieving MCID (82.7% vs 65.3%, $p=0.008$) suggests that surgical repair is more likely to result in meaningful clinical improvement from the patient's perspective. This finding is particularly important in the context of shared decision-making and patient counseling. It aligns with the results of Kuhn et al. (2013), who found that a higher percentage of patients treated surgically achieved clinically significant improvements compared to those treated conservatively.

The subgroup analysis (Table 5) provides nuanced insights into the effectiveness of surgical versus conservative management for different patient populations: Both small-medium and large-massive tears showed better outcomes with surgical repair, but the difference was more pronounced for large-massive tears. This finding is consistent with the literature suggesting that larger tears may benefit more from surgical intervention. Gerber et al. (2000) reported that tear size was a significant predictor of outcome following rotator cuff repair, with larger tears showing greater improvement post-surgery compared to baseline. The subgroup analysis by age reveals that while both age groups tended to have better outcomes with surgery, the difference was statistically significant only for patients under 60 years. This aligns with the findings of Charousset et al. (2010), who reported better outcomes in younger patients following arthroscopic rotator cuff repair. The non-significant difference in the older age group (≥ 60 years) suggests that conservative management may be

a reasonable option for some older patients, particularly those with lower functional demands or higher surgical risks.

The findings of this study suggest that surgical repair of rotator cuff tears offers several advantages over conservative management, particularly in terms of pain relief, functional improvement, and quality of life. However, the benefits of surgery must be weighed against the risks and the required recovery period. The more pronounced benefits of surgery in younger patients and those with larger tears can guide clinical decision-making. For these patient groups, early surgical intervention may be particularly beneficial. Conversely, older patients or those with smaller tears may be suitable candidates for an initial trial of conservative management, with the option of surgery if conservative measures fail. The trajectory of improvement over time highlights the importance of patient education regarding the expected recovery process following both surgical and conservative management. Patients opting for surgery should be counseled about the potential for slower initial recovery followed by more substantial long-term gains. The high proportion of patients achieving clinically significant improvement with both treatments underscores the overall effectiveness of current management strategies for rotator cuff tears. However, the higher rate of meaningful improvement in the surgical group supports its consideration as a primary treatment option for many patients.

CONCLUSION

In conclusion, this study provides evidence supporting the effectiveness of surgical repair for many patients with rotator cuff tears, while also demonstrating that conservative management can lead to meaningful improvements in a significant proportion of patients. The decision between surgical and conservative management should be individualized, taking into account factors such as age, tear size, functional demands, and patient preferences. As our understanding of rotator cuff pathology and healing continues to evolve, ongoing research will be crucial in refining our approach to this common and impactful condition. Future research should focus on longer-term follow-up to assess the durability of outcomes and the potential for tear progression or re-tear in both surgically and conservatively managed patients. Additionally, studies incorporating more detailed imaging analysis to correlate structural healing with functional outcomes could provide valuable insights into the mechanisms underlying the observed clinical improvements. Economic analyses comparing the cost-effectiveness of surgical versus conservative management would be beneficial, particularly given the significant healthcare costs associated with both approaches. Such analyses should consider not only direct medical costs but also indirect costs related to time off work and long-term disability. Finally, further investigation into patient-

specific factors that predict success with either surgical or conservative management could help refine treatment algorithms and improve patient selection for each approach.

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