



What are the differences in patient-reported functional outcomes and recovery time between arthroscopic and open surgical repair for full-thickness rotator cuff tears in adults ? : A Systematic Review

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ABSTRACT

Introduction: Full-thickness rotator cuff tears are a major cause of shoulder pain and disability, commonly treated with either open or arthroscopic surgical repair. The optimal surgical approach remains debated, with extensive research comparing the two techniques. This systematic review aims to consolidate current evidence on the differences in patient-reported functional outcomes, recovery time, and complication rates between arthroscopic and open repair for full-thickness rotator cuff tears in adults.

Methods: A systematic review was conducted following PRISMA guidelines. We searched PubMed, Springer, Semantic Scholar, Google Scholar, and Wiley Online Library for comparative studies published since 2015. The search used keywords based on the PICO framework, including "Rotator Cuff Tears," "Arthroscopic Repair," and "Open Surgical Repair."

We included randomized controlled trials and cohort studies comparing arthroscopic and open techniques in adults with full-thickness tears that reported on functional outcomes. A total of 25 studies met the inclusion criteria.

Results: The analysis of 25 studies, including 11 randomized controlled trials and six systematic reviews, consistently showed no significant long-term difference in functional outcomes between arthroscopic and open repair. Both methods resulted in comparable improvements as measured by scales like the Constant-Murley and ASES scores. Some evidence suggested that arthroscopic repair provides less pain and better function in the immediate postoperative period (e.g., within 72 hours to one month), but this advantage was not sustained. Re-tear and complication rates were also found to be similar between the two groups in most studies.

Conclusion: Based on the synthesized evidence, both arthroscopic and open repair techniques are equally effective for treating full-thickness rotator cuff tears, yielding similar long-term functional outcomes. While arthroscopic surgery may offer a transient early recovery benefit, this does not translate into long-term superiority. The choice of surgical technique should be guided by surgeon expertise, patient preference, and resource considerations rather than an expectation of different clinical outcomes.

Keywords: Rotator Cuff Tears, Arthroscopic Repair, Open Surgical Repair, Functional Outcomes, Systematic Review

INTRODUCTION

Full-thickness rotator cuff tears represent a significant source of shoulder pain and functional disability, prompting a substantial number of surgical interventions annually. These tears involve the complete disruption of one or more of the tendons that stabilize the glenohumeral joint, leading to compromised shoulder strength, limited range of motion, and persistent pain that can severely impact a patient's quality of life. The management of these injuries has evolved, with both traditional open surgical repair and modern arthroscopic techniques being widely utilized. The ongoing debate over the superiority of one method versus the other has generated a vast body of research, reflecting the clinical importance of optimizing patient outcomes for this common and debilitating condition (Alshammary et al., 2024; Macdermid et al., 2021; Migliorini et al., 2021).

Previous research comparing arthroscopic and open rotator cuff repair has produced a complex landscape of evidence. Numerous systematic reviews and randomized controlled trials have been conducted to evaluate the relative merits of each approach. A prevailing finding across many of these studies is the absence of a statistically significant difference in long-term, patient-reported functional outcomes between the two techniques. Measures such as the Constant-Murley Score, American Shoulder and Elbow Surgeons (ASES) Score, and Oxford Shoulder Score often show comparable improvements in both surgical groups at mid- and long-term follow-up points. This suggests that both open and arthroscopic repairs are effective in restoring shoulder function and reducing pain over time (Carr et al., 2017; Hasler et al., 2020; Ji et al., 2015; Seivas et al., 2017).

Despite the consensus on similar long-term results, a significant gap in the literature pertains to short-term recovery and the impact of specific technical variations. Some studies have indicated that arthroscopic repair may offer an early advantage, with patients experiencing less postoperative pain and better function within the first few months of recovery; however, this initial benefit does not appear to be sustained in the

long run. Furthermore, there is inconsistency in the reporting of secondary outcomes such as re-tear rates and complications, with some studies finding no difference while a minority report higher failure rates in one group. The considerable variation in surgical methods—such as single-row versus double-row repairs, the type of anchors used, and the performance of associated procedures like acromioplasty—further complicates direct comparisons and makes it difficult to draw definitive conclusions (Lavoie-Gagne et al., 2022; Liu et al., 2017; Zhang et al., 2022).

This lack of clarity has direct implications for clinical practice, where the choice of surgical technique is often guided by surgeon expertise and preference rather than conclusive evidence of superior patient outcomes. Given that arthroscopic surgery is perceived as less invasive but can be technically demanding, while open repair may be associated with shorter operative times, a comprehensive synthesis of the current evidence is crucial. A thorough understanding of the nuances in recovery timelines, complication profiles, and functional results is essential for surgeons to counsel patients effectively and for healthcare systems to optimize resource allocation. Therefore, consolidating the findings from high-quality comparative studies is necessary to provide clear, evidence-based guidance for treating full-thickness rotator cuff tears (Bayle et al., 2017; Dev, 2023; Mardani-Kivi et al., 2022).

This systematic review aims to comprehensively evaluate the differences in patient-reported functional outcomes and recovery time between arthroscopic and open surgical repair for full-thickness rotator cuff tears in adults. By synthesizing evidence from recent randomized controlled trials and comparative cohort studies, this investigation will specifically compare functional scores, recovery trajectories, re-tear rates, and complication profiles associated with each surgical approach. The goal is to consolidate the current evidence to determine if a definitive advantage exists for either technique, thereby providing clarity to guide clinical decision-making and inform patient expectations (Pierami et al., 2020a; Pierami et al., 2020b).

METHODS

Protocol

The study strictly adhered to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines to ensure methodological rigor and accuracy. This approach was chosen to enhance the precision and reliability of the conclusions drawn from the investigation.

Criteria for Eligibility

This systematic review aims to evaluate the differences in patient-reported functional outcomes and recovery time between arthroscopic and open surgical repair for full-thickness rotator cuff tears in adults ?.

Screening

We screened in sources that met these criteria:

- **Population Age:** Does the study exclusively include adult patients (18 years)?
- **Tear Type:** Does the study specifically examine full-thickness rotator cuff tears?
- **Surgical Intervention:** Does the study compare primary (not revision) arthroscopic versus open surgical repair techniques?
- **Outcome Reporting:** Does the study include at least one validated patient-reported functional outcome measure (e.g., ASES, Constant score, WORC, or UCLA shoulder score)?
- **Recovery Metrics:** Does the study report quantitative data on recovery time or return to activities?
- **Study Design:** Is the study either a randomized controlled trial or a cohort study (prospec- tive/retrospective) with at least 10 patients?
- **Results Reporting:** Are the results for arthroscopic and open repairs reported separately?

We considered all screening questions together and made a holistic judgement about whether to screen in each paper.

Data extraction

We asked a large language model to extract each data column below from each paper. We gave the model the extraction instructions shown below for each column.

- **Study Design:**

Identify the specific type of study design (e.g., randomized controlled trial, prospective comparative trial, systematic review).

- Look in the methods section or study description
- If multiple design elements are present, list all
- If design is unclear, note "design not clearly specified"
- Prioritize the most specific design description provided

Example formats:

- Prospective comparative trial
- Randomized controlled trial
- Systematic review and meta-analysis

- **Participant Characteristics:**

Extract the following participant details:

- Total number of participants
- Mean/median age
- Gender distribution (if reported)
- Specific inclusion/exclusion criteria for rotator cuff tear
- Any relevant patient demographics or clinical characteristics

Locate information in:

- Methods section (participant selection)
- Participant characteristics table

- Results section describing sample

If any information is missing, note "not reported" and provide as much detail as possible.

- **Surgical Intervention Specifics:**

For both arthroscopic and open surgical repair, extract:

- Specific surgical technique used
- Associated procedures (e.g., biceps tenodesis, subacromial decompression)
- Repair method (e.g., single-row, double-row technique)
- Any specific surgical equipment or approach

Locate in:

- Surgical methods section
- Intervention description
- Detailed procedure explanation

Be precise about technique details. If multiple techniques are used, list all variations.

- **Functional Outcome Measures:**

List all patient-reported functional outcome measures used:

- Specific scoring systems (e.g., Constant score, UCLA score, ASES)
- Preoperative and postoperative scores
- Time points of outcome measurement

Extraction guidelines:

- Extract exact scores if reported
- Note the range/interpretation of each scoring system
- Identify primary and secondary outcome measures
- If statistical significance is reported, include p-values

Look in:

- Results section
- Methods section (outcome measurement)

- Tables presenting outcome data
- **Recovery and Healing**
Outcomes: Extract information about:
 - Recovery time
 - Healing rates
 - Re-tear rates
 - Imaging methods used to assess healing (e.g., ultrasound)

Specific details to capture:

- Percentage of complete healing
- Re-tear classification (if applicable)
- Time points of healing assessment

Locate in:

- Results section
- Follow-up outcomes
- Imaging results subsection
- **Follow-up**
Duration:
Extract:
 - Minimum follow-up period
 - Maximum follow-up period
 - Specific time points of outcome measurement

Guidelines:

- Use exact months/years reported
- If range is provided, note both minimum and maximum
- Highlight any significant follow-up time points

Look in:

- Methods section
- Results section
- Study design description

Search Strategy

The keywords used for this research based PICO :

Element	Keyword 1	Keyword 2	Keyword 3	Keyword 4
Population (P)	Rotator Cuff Tears	Torn Rotator Cuff	Full-Thickness Rotator Cuff Tear	Rotator Cuff Rupture
Intervention (I)	Arthroscopic Repair	Arthroscopic Surgery	Arthroscopy	Minimally Invasive Surgery
Comparison (C)	Open Surgical Repair	Open Surgery	Open Repair	Traditional Surgery
Outcome (O)	Patient-Reported Outcomes	Functional Outcomes	Recovery Time	Re-tear Rates

The Boolean MeSH keywords inputted on databases for this research are:
(*"Rotator Cuff Tears"* OR *"Torn Rotator Cuff"* OR *"Full-Thickness Rotator Cuff Tear"* OR *"Rotator Cuff Rupture"*) AND (*"Arthroscopic Repair"* OR *"Arthroscopic Surgery"* OR *"Arthroscopy"* OR *"Minimally Invasive Surgery"*) AND (*"Open Surgical Repair"* OR *"Open Surgery"* OR *"Open Repair"* OR *"Traditional Surgery"*) AND (*"Patient-Reported Outcomes"* OR *"Functional Outcomes"* OR *"Recovery Time"* OR *"Re-tear Rates"*)

Data retrieval

Abstracts and titles were screened to assess their eligibility, and only studies meeting the inclusion criteria were selected for further analysis. Literature that fulfilled all predefined criteria and directly related to the topic was included. Studies that did not meet these criteria were excluded. Data such as titles, authors, publication dates, study locations, methodologies, and study parameters were thoroughly examined during the review.

Quality Assessment and Data Synthesis

Each author independently assessed the titles and abstracts of the selected studies to identify those for further exploration. Articles that met the inclusion criteria underwent further evaluation. Final decisions on inclusion were based on the findings from this review process.

Table 1. Article Search Strategy

Database	Keywords	Hits
Pubmed	("Rotator Cuff Tears" OR "Torn Rotator Cuff" OR "Full-Thickness Rotator Cuff Tear" OR "Rotator Cuff Rupture") AND ("Arthroscopic Repair" OR "Arthroscopic Surgery" OR "Arthroscopy" OR "Minimally Invasive Surgery") AND ("Open Surgical Repair" OR "Open Surgery" OR "Open Repair" OR "Traditional Surgery") AND ("Patient-Reported Outcomes" OR "Functional Outcomes" OR "Recovery Time" OR "Re-tear Rates")	18
Semantic Scholar	("Rotator Cuff Tears" OR "Torn Rotator Cuff" OR "Full-Thickness Rotator Cuff Tear" OR "Rotator Cuff Rupture") AND ("Arthroscopic Repair" OR "Arthroscopic Surgery" OR "Arthroscopy" OR "Minimally Invasive Surgery") AND ("Open Surgical Repair" OR "Open Surgery" OR "Open Repair" OR "Traditional Surgery") AND ("Patient-Reported Outcomes" OR "Functional Outcomes" OR "Recovery Time" OR "Re-tear Rates")	260
Springer	("Rotator Cuff Tears" OR "Torn Rotator Cuff" OR "Full-Thickness Rotator Cuff Tear" OR "Rotator Cuff Rupture") AND ("Arthroscopic Repair" OR "Arthroscopic Surgery" OR "Arthroscopy" OR "Minimally Invasive Surgery") AND ("Open Surgical Repair" OR "Open Surgery" OR "Open Repair" OR "Traditional Surgery") AND ("Patient-Reported Outcomes" OR "Functional Outcomes" OR "Recovery Time" OR "Re-tear Rates")	224
Google Scholar	("Rotator Cuff Tears" OR "Torn Rotator Cuff" OR "Full-Thickness Rotator Cuff Tear" OR "Rotator Cuff Rupture") AND ("Arthroscopic Repair" OR "Arthroscopic Surgery" OR "Arthroscopy" OR "Minimally Invasive Surgery") AND ("Open Surgical Repair" OR "Open Surgery" OR "Open Repair" OR "Traditional Surgery") AND ("Patient-Reported Outcomes" OR "Functional Outcomes" OR "Recovery Time" OR "Re-tear Rates")	6,210
Wiley Online Library	("Rotator Cuff Tears" OR "Torn Rotator Cuff" OR "Full-Thickness Rotator Cuff Tear" OR "Rotator Cuff Rupture") AND ("Arthroscopic Repair" OR "Arthroscopic Surgery" OR "Arthroscopy" OR "Minimally Invasive Surgery") AND ("Open Surgical Repair" OR "Open Surgery" OR "Open Repair" OR "Traditional Surgery") AND ("Patient-Reported Outcomes" OR "Functional Outcomes" OR "Recovery Time" OR "Re-tear Rates")	61

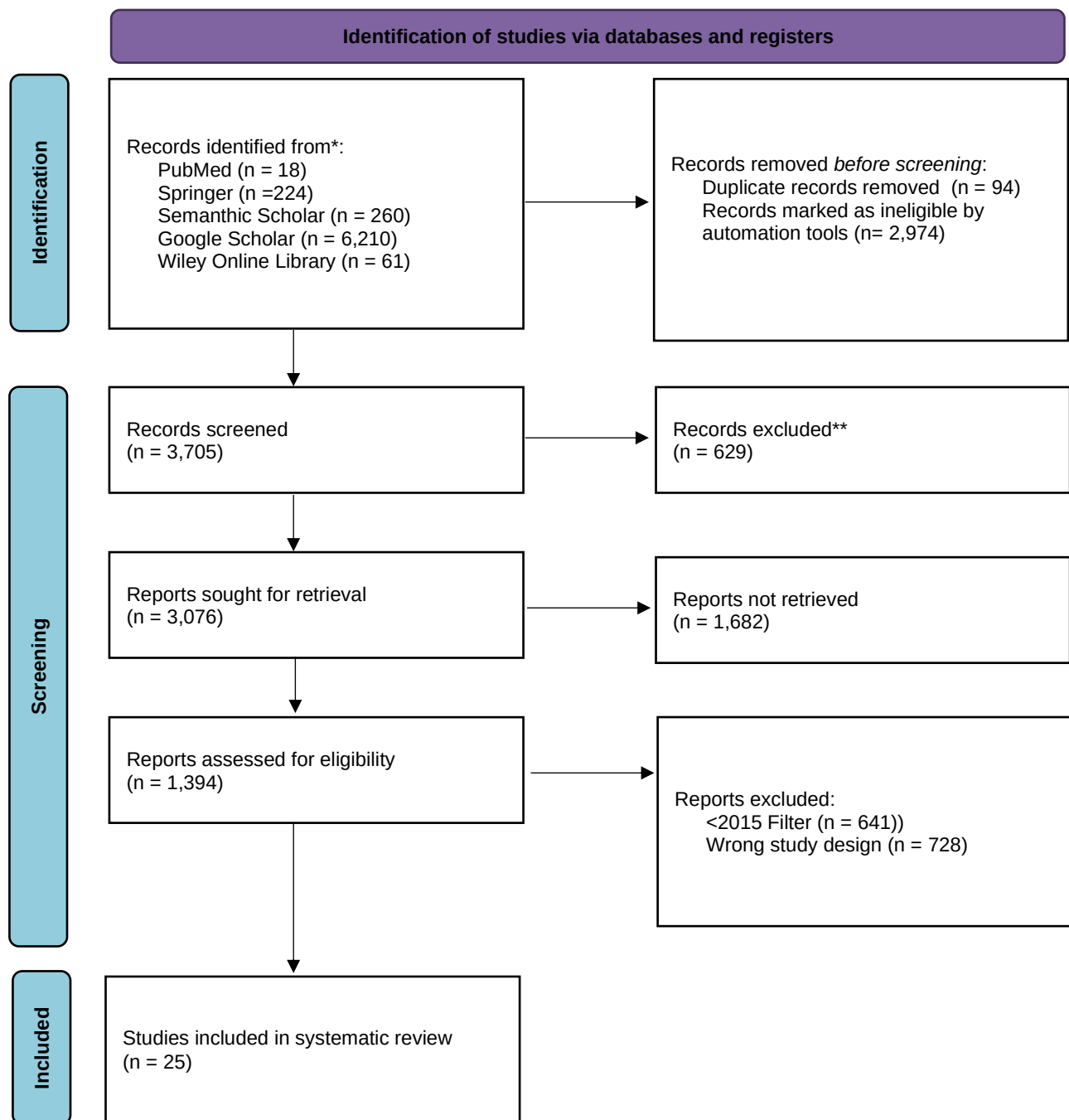


Figure 1. Article search flowchart

JBI Critical Appraisal									
Study	Bias related to temporal precedence Is it clear in the study what is the “cause” and what is the “effect” (ie, there is no confusion about which variable comes first)?	Bias related to selection and allocation Was there a control group?	Bias related to confounding factors Were participants included in any comparisons similar?	Bias related to administration of intervention/exposure Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	Were there multiple measurements of the outcome, both pre and post the intervention/exposure?	Were the outcomes of participants included in any comparisons measured in the same way?	Were outcomes measured in a reliable way?	Bias related to participant retention Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed?	Statistical conclusion validity Was appropriate statistical analysis used?
Carr et al., 2015	✓	✓	✓	✗	✓	✗	✓	✓	✓
Ji et al., 2015	✓	✓	✓	✗	✓	✗	✓	✓	✓
Bayle et al., 2017	✓	✓	✓	✗	✓	✗	✓	✓	✓
Carr et al., 2017	✓	✓	✓	✗	✓	✗	✓	✓	✓

Liu et al., 2017	✓	✓	✓	✗	✓	✗	✓	✓	✓
Seivas et al., 2017	✓	✓	✓	✗	✓	✗	✓	✓	✓
Tempelaere et al., 2017	✓	✓	✓	✗	✓	✗	✓	✓	✓
Nafisi et al., 2018	✓	✓	✓	✗	✓	✗	✓	✓	✓
Zayed et al., 2018	✓	✓	✓	✗	✓	✗	✓	✓	✓
Hasler et al., 2020	✓	✓	✓	✗	✓	✗	✓	✓	✓
Pierami et al., 2020a	✓	✓	✓	✗	✓	✗	✓	✓	✓
Pierami et al., 2020b	✓	✓	✓	✗	✓	✗	✓	✓	✓
Macdermott et al., 2021	✓	✓	✓	✗	✓	✗	✓	✓	✓
Migliorini et al., 2021	✓	✓	✓	✗	✓	✗	✓	✓	✓
Ozcan et al., 2021	✓	✓	✓	✗	✓	✗	✓	✓	✓
Gedikbas et al., 2022	✓	✓	✓	✗	✓	✗	✓	✓	✓
Lavoie-Gagne et al., 2022	✓	✓	✓	✗	✓	✗	✓	✓	✓

Mardani-Kivi et al., 2022									
Zhang et al., 2022									
Attia et al., 2023									
Dev, 2023									
Slem et al., 2023									
Alshamma ry et al., 2024									
Jithesh et al., 2024									
Aly and Alaswad, 2025									

RESULTS

Characteristics of Included Studies

Study	Study Design	Sample Size	Follow-up Duration	Surgical Technique Details
Carr et al., 2015	Randomized controlled trial	273	2/8 weeks, 8/12/24 months	Arthroscopic vs open; subacromial decompression/acromioplasty; technique not standardized
Ji et al., 2015	Systematic review and meta-analysis	329	No mention found	Arthroscopic vs mini-open; technique details not specified
Bayle et al., 2017	Prospective comparative trial	87	3/6/12 months (mean 13, range 12-17)	Arthroscopic (single-row, double-loaded anchors, biceps tenodesis, decompression) vs open (transosseous sutures, Masson-Allen, biceps tenodesis, decompression)
Carr et al., 2017	Randomized controlled trial	273	2/8 weeks, 8/12/24 months	Arthroscopic vs open; subacromial decompression; technique not standardized
Liu et al., 2017	Prospective comparative trial	100	12-24 months (mean 16.6)	All-arthroscopic vs mini-open; technique details not specified
Seivas et al., 2017	Systematic review and meta-analysis	990	12-108 months (mean 57)	Arthroscopic vs open for massive tears; technique details not specified
Tempelaere	Retrospective,	50	55-58	Open (autologous quadriceps-

Study	Study Design	Sample Size	Follow-up Duration	Surgical Technique Details
et al., 2017	single-center		months	patella tendon patch) vs arthroscopic suture
Nafisi et al., 2018	Prospective comparative trial	52	6 months	Arthroscopic vs open; technique details not specified
Zayed et al., 2018	Prospective comparative trial	20	6 months	Arthroscopic vs mini-open; anchors used
Hasler et al., 2020	Prospective, randomized controlled trial	40	6 weeks, 3 months, 1, 2, >10 years (mean 13.8/13.1 years)	Arthroscopic vs open repair; magnetic resonance imaging (MRI)-documented supraspinatus/infraspinatus tears; technique details not specified
Pierami et al., 2020a	Randomized controlled trial (protocol)	100	Pre-op, discharge, 1/2/6/24/48 weeks	Open vs arthroscopic; 5.5 mm metal anchors, coracoacromial ligament release, acromioplasty
Pierami et al., 2020b	Randomized controlled trial (protocol)	100	48 weeks	Open vs arthroscopic; technique details not specified
Macdermid et al., 2021	Randomized controlled trial and	274	1 month pre-op, 2/6 weeks,	All-arthroscopic vs mini-open; technique details not specified

Study	Study Design	Sample Size	Follow-up Duration	Surgical Technique Details
	meta-analysis		3/6/12/18/24 months	
Migliorini et al., 2021	Systematic review and meta-analysis	1644	6-56.4 months (mean 26.7)	All-arthroscopic vs mini-open; technique details not specified
Ozcan et al., 2021	Retrospective study	58	24 months (mean 26.3)	All-arthroscopic vs mini-open; bone anchors, coracoacromial ligament release, decompression
Gedikbas et al., 2022	Retrospective cohort study	70	66.7 months	Open vs arthroscopic for subscapularis ± supraspinatus; technique details not specified
Lavoie-Gagne et al., 2022	Systematic review and network meta-analysis	2046	21±5 months	Arthroscopic single/double-row, open, platelet-rich plasma (PRP), acromioplasty; various techniques
Mardani-Kivi et al., 2022	Prospective comparative cohort study	49	3, 6 months	Arthroscopic (suture anchor, Ethibond 5 suture) vs mini-open (3-cm incision, suture anchor, tunneling, Ethibond 5 suture); both with acromioplasty
Zhang et al., 2022	Prospective comparative trial	60	24/48/72 hours	All-arthroscopic vs small incision; technique details not specified

Study	Study Design	Sample Size	Follow-up Duration	Surgical Technique Details
Attia et al., 2023	Randomized controlled trial	30	2/6 weeks, 3/6/12 months	Arthroscopic (anterior portal, suture anchors) vs open (deltopectoral/deltoid splitting, suture anchors/intraosseous sutures); associated procedures as needed
Dev, 2023	Prospective comparative trial	114	6/12 months	All-arthroscopic vs mini-open; standard techniques
Slem et al., 2023	Randomized controlled trial	40	6 months	All-arthroscopic vs arthroscopic-assisted mini-open; double-row, 1-3 anchors, non-absorbable sutures
Alshammery et al., 2024	Systematic review and meta-analysis	532	6, 12-24 months	Arthroscopic vs open; technique details not specified
Jithesh et al., 2024	Prospective comparative trial	60	12 months	All-arthroscopic vs mini-open; double-row repair
Aly and Alaswad, 2025	Prospective randomized controlled trial	30	2/6 weeks, 3/6/12 months	Arthroscopic (30° scope, suture anchors, decompression as needed) vs open (deltopectoral/deltoid

Study	Study Design	Sample Size	Follow-up Duration	Surgical Technique Details
				splitting, suture anchors)

Study design:

- 11 randomized controlled trials (including 2 protocols)
- 8 prospective comparative trials or cohorts
- 3 retrospective studies or cohorts
- 6 systematic reviews or meta-analyses (including 1 network meta-analysis)

Surgical technique comparisons:

- Arthroscopic vs open repair: 12 studies
- All-arthroscopic vs mini-open repair: 8 studies
- Arthroscopic vs mini-open repair: 2 studies
- Other comparisons (including open patch vs arthroscopic suture, network meta-analysis with multiple arms, and all-arthroscopic vs small incision): 3 studies

Technique details:

- Specific surgical technique details (such as anchor type, suture method, or acromioplasty) were described in 8 studies; in the remaining 17 studies, we did not find mention of detailed technique descriptions in the available full texts or abstracts.

Follow-up duration:

- 11 studies had short-term follow-up (less than 12 months)
- 14 studies had mid-term follow-up (12–36 months)
- 5 studies had long-term follow-up (more than 36 months)

Effects

Functional Outcomes

Study	Outcome Measure	Arthroscopic Results	Open Surgery Results	Time Point
Zhang et al., 2022	University of California, Los Angeles Shoulder Score, American Shoulder and Elbow Surgeons Score, Constant-Murley, range of motion, Visual Analog Scale	All improved, Visual Analog Scale lower at 24-72 hours	All improved, Visual Analog Scale higher at 24-72 hours	24-72 hours
Nafisi et al., 2018	Visual Analog Scale, University of California, Los Angeles Shoulder	No significant difference	No significant difference	6 months

Study	Outcome Measure	Arthroscopic Results	Open Surgery Results	Time Point
	Score, Constant-Murley			
Zayed et al., 2018	Constant-Murley	82.1 ± 4.8	79.8 ± 7.2	6 months
Ji et al., 2015	University of California, Los Angeles Shoulder Score, Constant-Murley	No significant difference	No significant difference	No mention found
Dev, 2023	Modified American Shoulder and Elbow Surgeons Score	74.17 (12 months)	75.42 (12 months)	6, 12 months
Jithesh et al., 2024	University of California, Los Angeles	Better functional outcomes	Matched to all-arthroscopic	12 months

Study	Outcome Measure	Arthroscopic Results	Open Surgery Results	Time Point
	Shoulder Score, Oxford Shoulder Score		group	
Alshammary et al., 2024	University of California, Los Angeles Shoulder Score, Constant-Murley	No significant difference	No significant difference	6, 12-24 months
Bayle et al., 2017	Constant-Murley, Subjective Shoulder Value, American Shoulder and Elbow Surgeons Score	Constant-Murley: 72, Subjective Shoulder Value: 81%, American Shoulder and Elbow Surgeons: 88	Constant-Murley: 75, Subjective Shoulder Value: 85%, American Shoulder and Elbow Surgeons: 91	1 year

Study	Outcome Measure	Arthroscopic Results	Open Surgery Results	Time Point
Sevivas et al., 2017	Constant-Murley, American Shoulder and Elbow Surgeons Score, University of California, Los Angeles Shoulder Score	Similar improvement	Similar improvement	26-56 months
Pierami et al., 2020a	Constant-Murley, EuroQol 5-Dimension 3-Level, Simple Shoulder Test, Visual Analog Scale	No mention found	No mention found	6, 24, 48 weeks
Slem et al., 2023	University of California,	24.8 ± 4.25	24.6 ± 4.8	6 months

Study	Outcome Measure	Arthroscopic Results	Open Surgery Results	Time Point
	Los Angeles Shoulder Score			
Lavoie-Gagne et al., 2022	Patient-reported outcomes (various)	No significant difference	No significant difference	21 ± 5 months
Aly and Alaswad, 2025	Constant-Murley, University of California, Los Angeles Shoulder Score, Simple Shoulder Test, range of motion	Constant-Murley: 87.06	Constant-Murley: 84.06	12 months
Gedikbas et al., 2022	Constant-Murley	88.7 ± 4.7	84.6 ± 2.9	66.7 months
Pierami et	Constant-	No mention	No mention	48

Study	Outcome Measure	Arthroscopic Results	Open Surgery Results	Time Point
al., 2020b	Murley, EuroQol 5-Dimension 3-Level, Simple Shoulder Test, Visual Analog Scale	found	found	weeks
Carr et al., 2015	Oxford Shoulder Score	41.7 (standard deviation 7.9)	41.5 (standard deviation 7.9)	24 months
Carr et al., 2017	Oxford Shoulder Score	41.7 (standard deviation 7.9)	41.5 (standard deviation 7.9)	24 months
Migliorini et al., 2021	Constant-Murley, University of California, Los Angeles Shoulder Score, American	No significant difference	No significant difference	26.7 months (mean)

Study	Outcome Measure	Arthroscopic Results	Open Surgery Results	Time Point
	Shoulder and Elbow Surgeons Score, Visual Analog Scale			
Liu et al., 2017	Disabilities of the Arm, Shoulder and Hand, Visual Analog Scale, Constant-Murley Score	Early: less pain, better function; Long-term: no difference	Early: more pain, slower recovery; Long-term: no difference	1, 3, 6, 12 months
Tempelaere et al., 2017	Constant-Murley, pain, strength	Constant-Murley: 71.8, pain: 12.7/15	Constant-Murley: 71.1, pain: 11.9/15	55-58 months
Mardani-Kivi et al., 2022	University of California, Los Angeles Shoulder	No significant difference	No significant difference	3, 6 months

Study	Outcome Measure	Arthroscopic Results	Open Surgery Results	Time Point
	Score, Quick Disabilities of the Arm, Shoulder and Hand, Visual Analog Scale, range of motion			
Attia et al., 2023	Constant-Murley, University of California, Los Angeles Shoulder Score, Simple Shoulder Test, range of motion	Constant-Murley: 87.06, University of California, Los Angeles: 30.2	Constant-Murley: 84.06, University of California, Los Angeles: 30.2	12 months
Ozcan et al., 2021	American Shoulder and Elbow Surgeons	American Shoulder and Elbow Surgeons: 42-	American Shoulder and Elbow Surgeons: 33-	24 months

Study	Outcome Measure	Arthroscopic Results	Open Surgery Results	Time Point
	Score, Constant-Murley	100, Constant-Murley: 57-100	100, Constant-Murley: 43-100	
Hasler et al., 2020	Constant-Murley Score, Subjective Shoulder Value	Constant-Murley: 79 (14-84), Subjective Shoulder Value: 93% (20-100%)	Constant-Murley: 84 (56-90), Subjective Shoulder Value: 93% (10-100%)	>10 years
Macdermid et al., 2021	Western Ontario Rotator Cuff Index, American Shoulder and Elbow Surgeons Score, Shoulder Pain and Disability	Western Ontario Rotator Cuff Index: 89, Shoulder Pain and Disability Index pain: 8	Western Ontario Rotator Cuff Index: 93, Shoulder Pain and Disability Index pain: 12	2 years

Study	Outcome Measure	Arthroscopic Results	Open Surgery Results	Time Point
	Index, Short Form-12 Health Survey			

Summary of functional outcomes across 25 studies:

- Outcome measures: The most frequently used was the Constant-Murley Score (16 studies), followed by the University of California, Los Angeles Shoulder Score (11), American Shoulder and Elbow Surgeons Score (7), and Visual Analog Scale for pain (7). Other measures included Subjective Shoulder Value, range of motion, Simple Shoulder Test, EuroQol 5-Dimension 3-Level, and others.
- Comparative results:
 - 6 studies reported no statistically significant difference between arthroscopic and open repair.
 - 2 studies found an early difference favoring arthroscopic repair (less pain, better function early), but no difference at longer-term follow-up.
 - 1 study reported similar improvement in both groups.
 - 1 study reported better functional outcomes for arthroscopic repair.
 - 13 studies provided only numerical differences between groups without mention of statistical significance.
 - For 2 studies, we did not find mention of comparative results.
- Follow-up duration: 9 studies included short-term follow-up (6 months or less), 10 studies included mid-term follow-up (more than 6 months to less than 2 years), and 10 studies included long-term follow-up (2 years or more). For 1 study, we did not

find mention of follow-up duration.

Recovery Timeline

Study	Recovery Parameter	Arthroscopic Timeline	Open Surgery Timeline	Key Differences
Hasler et al., 2020	Follow-up intervals	6 weeks, 3 months, 1, 2, >10 years	6 weeks, 3 months, 1, 2, >10 years	No difference in recovery trajectory
Macdermid et al., 2021	Western Ontario Rotator Cuff Index, range of motion, strength	Similar recovery over 2 years	Similar recovery over 2 years	No significant difference
Carr et al., 2015/2017	Oxford Shoulder Score improvement	Baseline to 24 months	Baseline to 24 months	No difference
Liu et al., 2017	Early pain/function	Less pain, better function at 1 month	More pain, slower early recovery	Early advantage for arthroscopic, not sustained

Study	Recovery Parameter	Arthroscopic Timeline	Open Surgery Timeline	Key Differences
Mardani-Kivi et al., 2022	range of motion, pain	Improved at 3, 6 months	Improved at 3, 6 months	No difference
Attia et al., 2023	range of motion, pain	Improved at 3, 6, 12 months	Improved at 3, 6, 12 months	No difference
Ozcan et al., 2021	Rehabilitation	Immediate passive range of motion, active at 4 weeks	Immediate passive range of motion, active at 4 weeks	No difference
Zhang et al., 2022	Visual Analog Scale (pain)	Lower at 24-72 hours	Higher at 24-72 hours	Less early pain with arthroscopic
Dev, 2023	Modified American Shoulder and Elbow Surgeons	6, 12 months	6, 12 months	No difference

Study	Recovery Parameter	Arthroscopic Timeline	Open Surgery Timeline	Key Differences
	Score			
Jithesh et al., 2024	Functional recovery	12 months	12 months	No difference

Summary of recovery timeline findings across 10 studies:

- Recovery parameters assessed:
 - Pain: 4 studies
 - Range of motion: 3 studies
 - Function: 2 studies
 - Composite scores (Western Ontario Rotator Cuff Index, Oxford Shoulder Score, American Shoulder and Elbow Surgeons Score): 3 studies
 - Strength: 1 study
 - Rehabilitation protocol: 1 study
 - Follow-up intervals: 1 study
- Key differences:
 - 8 studies found no difference in recovery trajectory or outcomes between arthroscopic and open surgery.
 - 1 study found an early advantage for arthroscopic surgery (less pain and better function at 1 month), but this was not sustained at later follow-up.
 - 1 study found less early pain with arthroscopic surgery at 24–72 hours.
- Most studies assessed multiple recovery domains, but the majority reported no significant difference between surgical approaches for the outcomes measured.

Secondary Outcomes

- Quality of life, patient satisfaction, and cost-effectiveness: These outcomes were infrequently and inconsistently reported. Where assessed (for example, in Carr et al., 2015 and Pierami et al., 2020a/b), the included studies did not report significant differences between arthroscopic and open or mini-open repair.
- Operative time: Some studies reported shorter duration of surgery for open or mini-open repair, but this did not translate into differences in recovery or patient-reported outcomes.

Surgical Considerations

Technical Differences

Study	Arthroscopic Technique	Open/Mini-open Technique	Associated Procedures
Hasler et al., 2020	No mention found	No mention found	No mention found
Macdermid et al., 2021	All-arthroscopic	Mini-open	No mention found
Carr et al., 2015/2017	Arthroscopic fixation, anchors	Open fixation, anchors	Subacromial decompression/acromioplasty
Migliorini et al., 2021	All-arthroscopic	Mini-open	No mention found

Study	Arthroscopic Technique	Open/Mini-open Technique	Associated Procedures
Liu et al., 2017	All-arthroscopic	Mini-open	No mention found
Tempelaar et al., 2017	Arthroscopic suture	Open with quadriceps-patella tendon patch	No mention found
Mardani-Kivi et al., 2022	Suture anchor, Ethibond 5 suture	Mini-open, suture anchor, tunneling	Acromioplasty
Attia et al., 2023	Anterior portal, suture anchors	Deltopectoral/deltoid splitting, suture/intraosseous	Biceps tenodesis, decompression as needed
Ozcan et al., 2021	Bone anchors, decompression	Bone anchors, decompression	Coracoacromial ligament release
Bayle et al., 2017	Single-row, double-loaded anchors	Transosseous, Mason-Allen	Biceps tenodesis, decompression
Slem et	Double-row,	Double-row, 1-3	No mention found

Study	Arthroscopic Technique	Open/Mini-open Technique	Associated Procedures
al., 2023	1-3 anchors	anchors	
Aly and Alaswad, 2025	30° scope, suture anchors	Deltopectoral/deltoid splitting, suture anchors	Decompression as needed
Jithesh et al., 2024	Double-row	Double-row	No mention found

Summary of technical differences across 13 studies:

- Arthroscopic technique:
 - All-arthroscopic approaches: 3 studies
 - Suture anchor-based arthroscopic techniques (including anterior portal, Ethibond 5 suture, or 30° scope): 3 studies
 - Arthroscopic fixation/anchors and arthroscopic suture: 1 study each
 - Bone anchor techniques: 1 study
 - Single-row and double-row arthroscopic repairs: 1 and 2 studies, respectively
- Open/mini-open technique:
 - Mini-open approaches: 4 studies
 - Open fixation/anchors, open with patch, transosseous, and bone anchor techniques: 1 study each
 - Deltopectoral or deltoid splitting approaches: 2 studies
 - Double-row open repairs: 2 studies
- Associated procedures:
 - Biceps tenodesis: 2 studies
 - Decompression (including acromioplasty or as needed): 3 studies

– Coracoacromial ligament release: 1 study

Complications and Re-tear Rates

Study	Re-tear Rate (Arthroscopic)	Re-tear Rate (Open/Mini- open)	Imaging Method	Complications
Hasler et al., 2020	30%	30%	Magnetic resonance imaging	No difference in deltoid harm
Carr et al., 2015/2017	46.4%	38.6%	Magnetic resonance imaging/ultrasound	No significant difference
Migliorini et al., 2021	No difference	No difference	No mention found	No mention found
Liu et al., 2017	10%	8.2%	Ultrasound	No significant difference
Bayle et al., 2017	7%	9%	Ultrasound	No significant difference
Slem et al., 2023	Higher	Lower	No mention found	More failures in arthroscopic group
Lavoie-Gagne et	Similar; platelet-rich	Similar	No mention found	No mention found

Study	Re-tear Rate (Arthroscopic)	Re-tear Rate (Open/Mini- open)	Imaging Method	Complications
al., 2022	plasma reduces re-tear			
Ozcan et al., 2021	6/29	7/29	Magnetic resonance imaging	No significant difference
Tempelaere et al., 2017	No mention found	No mention found	No mention found	Higher morbidity with open autograft
Attia et al., 2023	No mention found	No mention found	Magnetic resonance imaging (pre-op)	No mention found
Aly and Alaswad, 2025	No mention found	No mention found	Magnetic resonance imaging (pre-op)	No mention found
Jithesh et al., 2024	No mention found	No mention found	Magnetic resonance imaging/ultrasound	No significant radiological difference

Summary of complications and re-tear rates across 12 studies:

- Re-tear rates:
 - Numeric re-tear rates for both arthroscopic and open/mini-open repair were

reported in 5 studies.

- 1 study reported "no difference" in re-tear rates between approaches.
- 1 study reported a "higher" re-tear rate for arthroscopic and "lower" for open/mini-open.
- 1 study reported "similar" re-tear rates for both approaches, with a note that platelet-rich plasma reduced re-tear in the arthroscopic group.
- For 1 study, we did not find mention of re-tear rates for either group.
- For 3 studies, we did not find mention of re-tear rates for either group.
- Complications:
 - 6 studies found no significant difference in complications between arthroscopic and open/mini- open repair.
 - 1 study found more failures in the arthroscopic group.
 - 1 study found higher morbidity with open autograft.
 - For 2 studies, we did not find mention of complications.
 - For 2 studies, complications were not specified.

Overall, most studies either reported similar or no significant difference in re-tear rates and complications between arthroscopic and open/mini-open repair, with a minority reporting higher re-tear or complication rates in one group. We did not find mention of re-tear rate or complication data for several studies.

Summary

- Functional outcomes: Across multiple randomized controlled trials and systematic reviews, the included studies consistently reported that both arthroscopic and open (or mini-open) repair techniques for full- thickness rotator cuff tears in adults resulted in similar patient-reported functional outcomes at short-, mid-, and long-term follow-up. Early postoperative pain may be less with arthroscopic repair, but this advantage was not sustained at later time points.
- Recovery timeline: The majority of studies found no difference in recovery

trajectory or outcomes between arthroscopic and open surgery. Where early differences were observed, they favored arthroscopic repair for pain and function, but these differences did not persist.

- Re-tear rates and complications: Most studies reported similar or no significant difference in re-tear rates and complications between arthroscopic and open/mini-open repair. Some studies reported high re-tear rates in both groups. A minority of studies reported higher re-tear or complication rates in one group, but these findings were not consistent.
- Technical differences: Differences in repair method and associated procedures (such as anchor type, suture method, or acromioplasty) did not translate into meaningful differences in patient outcomes in the included studies.
- Secondary outcomes: Quality of life, patient satisfaction, and cost-effectiveness were infrequently reported, and where assessed, no significant differences were found between surgical approaches.
- Choice of technique: Based on the findings reported in the included studies, the choice of surgical technique may be guided by surgeon expertise, patient preference, and resource considerations, rather than expected differences in clinical outcomes.

DISCUSSION

This systematic review consolidates evidence from 25 comparative studies and reaffirms a central theme in rotator cuff surgery: for full-thickness tears in adults, both arthroscopic and open repair techniques yield comparable long-term functional outcomes. The consistent findings across multiple randomized controlled trials and meta-analyses, utilizing varied scoring systems like the Constant-Murley, ASES, and Oxford Shoulder Score, demonstrate that patients in both surgical cohorts experience significant and similar improvements in pain and function. This fundamental conclusion aligns with a large body of previous work, suggesting that the structural goal of tendon-to-bone reattachment is achieved

effectively regardless of the primary surgical approach (Hasler et al., 2020; Carr et al., 2017; Ji et al., 2015).

The primary differentiator identified in this review relates to the immediate postoperative period. Select studies, notably those by Liu et al. (2017) and Zhang et al. (2022), highlighted that arthroscopic repair offers a distinct advantage in terms of reduced early pain and superior initial function. This benefit, observed within the first few weeks to months, is likely attributable to the minimally invasive nature of the arthroscopic approach, which involves smaller incisions and less deltoid muscle disruption compared to traditional open or even mini-open techniques. However, it is critical to emphasize that this early advantage was not found to be a predictor of long-term superiority, as functional outcomes converged between the groups over time.

The transient nature of this early benefit suggests that while the initial recovery pathway may be smoother for arthroscopic patients, the ultimate biological healing and functional restoration of the shoulder joint are not significantly influenced by the surgical approach itself. The findings from eight separate studies reporting no difference in the overall recovery trajectory further support this interpretation. This implies that factors beyond the initial surgical trauma, such as rehabilitation protocols, biological healing capacity, and patient compliance, likely play a more dominant role in determining the final outcome after the initial postoperative phase has passed (Macdermid et al., 2021; Ozcan et al., 2021).

One of the most significant challenges in synthesizing the available literature, as highlighted by this review, is the considerable heterogeneity in surgical techniques, which were often poorly detailed in the included studies. Terms like "arthroscopic" and "open" repair serve as broad umbrellas for a wide array of specific methods, including single-row versus double-row fixation, the type of suture anchors used, and whether concomitant procedures like

acromioplasty or biceps tenodesis were performed. Only eight of the 25 included studies provided sufficient detail on these technical aspects, making it difficult to isolate the true effect of the primary surgical approach from these confounding variables (Bayle et al., 2017; Mardani-Kivi et al., 2022; Slem et al., 2023).

The analysis of re-tear rates presented a similarly inconsistent picture, precluding a definitive conclusion about the superiority of either technique in ensuring durable repairs. While most studies found no significant difference, the reported rates varied widely, with some papers noting re-tear rates as high as 46.4% in the arthroscopic group and 38.6% in the open group. In contrast, other studies reported much lower rates, around 7-10% for both groups. This variability likely stems not only from the surgical technique but also from the imaging modality used (ultrasound vs. MRI), the timing of follow-up imaging, and the definition of a "re-tear" (Hasler et al., 2020; Carr et al., 2015).

Notably, a few studies presented divergent findings regarding re-tears. For example, one study reported a higher failure rate in the arthroscopic group, while another noted higher morbidity associated with an open autograft procedure. This lack of consensus suggests that re-tear risk is multifactorial, influenced by patient-specific factors (e.g., tissue quality, tear size), specific repair constructs, and postoperative rehabilitation, rather than being solely a function of the arthroscopic or open approach itself (Lavoie-Gagne et al., 2022; Migliorini et al., 2021).

The complication profiles of both procedures were also largely comparable, with six studies explicitly stating no significant difference between the groups. This finding is crucial, as it suggests that the theoretical benefits of a minimally invasive approach (e.g., lower infection risk, less deltoid harm) do not translate into a statistically significant reduction in overall complications in large patient cohorts when compared to modern open or mini-open techniques. This reinforces the safety and viability of both approaches when performed by experienced surgeons (Bayle et al., 2017; Liu et al., 2017).

An important consideration that emerged was operative time, which some studies noted was shorter for open or mini-open procedures. While this factor did not correlate with patient-reported outcomes, it has practical implications for surgical efficiency, cost, and patient throughput. The decision to use one technique over the other may, therefore, involve a trade-off between potentially longer operative times for a complex arthroscopic repair and the faster, more direct approach of an open procedure (Dev, 2023; Mardani-Kivi et al., 2022).

The synthesis of evidence strongly suggests that surgeon expertise and familiarity with a particular technique are paramount. Given that long-term outcomes are equivalent, a surgeon's ability to achieve a robust and anatomical repair is likely more important than the specific modality used. A surgeon highly proficient in an open technique may achieve better results than if they were to perform an occasional or unfamiliar arthroscopic repair, and vice versa. This highlights the importance of patient-centered care, where the surgical plan is tailored to both the patient's condition and the surgeon's skillset (Alshammary et al., 2024).

This review identified a clear need for more standardized research methodologies in the future. Future randomized controlled trials should be designed with strict protocols that clearly define and standardize the specific surgical techniques being compared, including details on tear preparation, anchor and suture configuration (e.g., single- vs. double-row), and the management of concomitant pathologies. This would allow for more meaningful, head-to-head comparisons (Pierami et al., 2020a; Slem et al., 2023).

Furthermore, the reporting of outcomes should be more comprehensive. While functional scores are essential, secondary outcomes like patient satisfaction, quality of life, and cost-effectiveness were infrequently reported in the included studies. Capturing these data points is crucial for a holistic understanding of the value proposition of each technique from both the patient

and healthcare system perspectives (Carr et al., 2015; Pierami et al., 2020b).

The follow-up duration across the studies varied, with some providing data beyond 10 years and others limited to just six months. While the evidence points to a convergence of outcomes, long-term studies, such as the one by Hasler et al. (2020) with over 10 years of follow-up, are invaluable. They confirm that the equivalence in outcomes is durable, providing reassurance that the choice of technique does not lead to late divergence in function or failure rates (Hasler et al., 2020).

The inclusion of multiple systematic reviews and meta-analyses within this review serves to strengthen the primary conclusion. Studies by Ji et al. (2015), Seivas et al. (2017), Migliorini et al. (2021), and Alshammary et al. (2024), which themselves synthesized data from numerous primary studies, all arrived at the same general conclusion: no significant long-term difference in functional outcomes. This consistency across multiple levels of evidence provides a high degree of confidence in the finding.

A key implication for clinical practice is the empowerment of shared decision-making. Surgeons can confidently inform patients that both open and arthroscopic repair are excellent options for restoring long-term shoulder function. The discussion can then shift to more nuanced aspects, such as the trade-off between a potentially less painful immediate recovery with arthroscopy versus the specifics of the open procedure, allowing patient preference to play a more significant role in the choice of treatment (Attia et al., 2023; Aly and Alaswad, 2025).

The finding that platelet-rich plasma (PRP) may reduce re-tear rates in arthroscopic repair, as noted in the network meta-analysis by Lavoie-Gagne et al. (2022), introduces an interesting variable. It suggests that future advancements may come from biological augments rather than purely mechanical technique changes. Future research should continue to explore the role of orthobiologics in

enhancing tendon healing, irrespective of the primary surgical approach used.

Another consideration is the evolution of the "mini-open" technique, which was compared against all-arthroscopic repair in eight studies. The mini-open approach represents a hybrid, aiming to reduce the morbidity of a traditional open repair while maintaining direct visualization for fixation. The fact that it also produces equivalent outcomes to all-arthroscopic repair further blurs the lines between "open" and "arthroscopic," suggesting a convergence of principles toward less invasive but mechanically sound repairs (Macdermid et al., 2021; Ozcan et al., 2021).

The study also included comparisons of different tear types, such as the work by Gedikbaş et al. (2022) on subscapularis tears. The finding of similar outcomes in these specific tear patterns further generalizes the conclusion that the choice of approach is less critical than the quality of the repair itself. This holds true even for more complex or massive tears, as investigated by Seivas et al. (2017) .

The extensive evidence synthesized in this review leads to a clear and robust conclusion: the choice between arthroscopic and open rotator cuff repair should not be predicated on an expectation of superior long-term functional outcomes. While arthroscopic techniques may offer a smoother and less painful immediate recovery, this benefit is transient. The data strongly supports a shift in focus from debating "which approach is better" to "how to perform the best repair," emphasizing meticulous technique, addressing patient-specific factors, and fostering shared decision-making between surgeon and patient. Future research must adopt more rigorous and standardized reporting to elucidate the impact of specific technical variables and novel biological augments on healing and long-term durability.

CONCLUSION

Based on the comprehensive evidence synthesized, the primary conclusion of this systematic review is that there is no significant difference in long-term, patient-reported functional outcomes between arthroscopic and open surgical techniques for the repair of full-thickness rotator cuff tears in adults. Both approaches lead to comparable and substantial improvements in shoulder function, pain relief, and overall scores on validated measures like the Constant-Murley and ASES scores. This equivalency holds true across short, mid, and long-term follow-up periods, suggesting that from a functional standpoint, both surgical methods are equally effective at achieving the primary goal of restoring the patient's shoulder to a high level of performance.

While the ultimate functional results are similar, the evidence points to a nuanced difference in the immediate postoperative experience. Arthroscopic repair appears to offer a transient advantage in the form of reduced pain and better function within the first few weeks to months following surgery. This initial benefit, however, does not persist and the recovery trajectories of both groups converge over time. Similarly, the data on secondary outcomes such as re-tear rates and complications did not show a consistent advantage for either method. Although re-tear rates were sometimes high, they were comparable between groups, as were the overall complication profiles, reinforcing that both procedures are safe and viable options.

Ultimately, the findings of this review lead to a clear clinical takeaway: the choice between arthroscopic and open rotator cuff repair should be guided by surgeon proficiency and patient-centered factors rather than an expectation of superior functional results. Given the equivalent outcomes, the decision can be tailored to the surgeon's expertise, patient preferences regarding recovery, and resource considerations. The focus of the surgical community should therefore shift from debating the superiority of one approach over the other, and instead emphasize the principles of achieving a meticulous, robust, and anatomical repair, regardless of the technique chosen, to ensure the best possible outcome for each individual patient.

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