



Comparative Outcomes of Arthroscopic Versus Open Rotator Cuff Repair

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Abstract

Rotator cuff repair has shifted almost entirely from the classical open, deltoid-splitting approach toward all-arthroscopic and arthroscopically assisted mini-open techniques, but whether this shift preserves functional outcomes and simply trades one set of risks for another has taken over a decade of comparative trial evidence to clarify. This short communication synthesizes that evidence, centered on the JOINTS Canada multicenter randomized trial (n=274) comparing all-arthroscopic against mini-open repair, its accompanying meta-analysis, earlier randomized trials, and independent systematic reviews. Across this evidence base, arthroscopic and mini-open repair produce statistically and largely clinically equivalent patient-reported outcomes at one to two years, with disease-specific quality-of-life scores improving similarly in both groups and only small, measurement-noise-level differences between them. Technique-specific risk, rather than functional outcome, is where the approaches diverge most clearly: fully open exposure carries a recognized risk of deltoid detachment that arthroscopic and mini-open techniques were designed to avoid, while structural retear across all exposures appears driven mainly by tear size, tissue quality, and fixation construct rather than incision size. Because almost none of the modern randomized evidence directly compares arthroscopic repair against a truly open, deltoid-takedown technique, and massive or irreparable tears remain underrepresented in the trial base, the strongest remaining gap is a comparative cohort that pairs standardized retear imaging with explicit deltoid-function outcomes across all three exposures.

Keywords: rotator cuff repair; arthroscopic surgery; open repair; shoulder outcomes; tendon retear

1. Introduction

Rotator cuff tears are common, and their prevalence rises steadily with age: population-based ultrasound screening of asymptomatic and symptomatic shoulders found tears in a substantial minority of people in their sixties and in the majority of those over eighty, with full-thickness tears becoming markedly more frequent after the fifth decade [1]. Surgical repair, when conservative treatment fails, has moved almost entirely away from the classical open deltoid-splitting approach toward techniques performed through small portals, either all-arthroscopically or with arthroscopic assistance to a limited open incision (mini-open repair). That shift happened well before the comparative trial evidence caught up with it, and a genuine surgeon-preference debate persisted for over a decade about whether the newer, less invasive techniques actually deliver equivalent tendon healing and shoulder function, or merely equivalent cosmesis. Most patients are offered surgery only after a trial of conservative management — activity modification, physical therapy, and subacromial injection — has failed to control pain or restore function, so the population reaching the operating room is already selected for tears that are unlikely to resolve without repair, which makes the choice of surgical exposure a decision that affects nearly every operative candidate rather than a small edge case. This short communication synthesizes the comparative clinical evidence — randomized trials, their pooled meta-analyses, and the technical literature on complications and rehabilitation — to summarize where that debate now stands.

2. Evolution of Surgical Technique from Open to Arthroscopic Repair

Open repair through a deltoid-splitting or deltoid-takedown approach was the historical standard because it gave the surgeon direct visualization and unrestricted suture-anchor placement across the tendon footprint, but it required detaching some portion of the anterior deltoid origin to expose the cuff, and violation or incomplete healing of that deltoid repair is a recognized, sometimes disabling complication of the open technique [2]. Arthroscopically assisted mini-open repair, in which the subacromial space is prepared and the tear pattern assessed arthroscopically before the cuff itself is repaired through a short muscle-splitting incision, was developed explicitly to preserve the deltoid

origin while keeping the technical familiarity of suture placement under direct vision; early technique reports described consistent tendon-to-bone fixation with a substantially smaller soft-tissue dissection than a formal open approach [3]. All-arthroscopic repair extended this logic further by eliminating the open incision altogether, and single-row and double-row (transosseous-equivalent) anchor constructs were subsequently compared against each other within the arthroscopic literature itself, a parallel debate about footprint coverage and biomechanical fixation strength that runs alongside, and is sometimes conflated with, the arthroscopic-versus-open question [4]. By the time large multicenter trials were designed to test arthroscopic against mini-open repair directly, true fully open repair had already become uncommon enough in many practices that the most rigorous comparative trials were built around the arthroscopic-versus-mini-open contrast rather than arthroscopic-versus-fully-open, which is itself informative about how the field's practice had already shifted ahead of the evidence [5].

Table 1: Key comparative studies of arthroscopic, mini-open, and open rotator cuff repair discussed in this synthesis, with study design and principal finding [6,7,8,10,11,2].

Study	Design	Comparison	Principal finding
MacDermid et al. (2021)	Multicenter RCT, n=274, plus meta-analysis	All-arthroscopic vs mini-open	Equivalent WORC improvement at 2 years; adjusted difference 3.4 points [6]
van der Zwaal et al. (2013)	RCT, n=100, 1-year follow-up	All-arthroscopic vs mini-open	Comparable clinical outcomes between groups [7]
Ji et al. (2015)	Meta-analysis of RCTs	Arthroscopic vs mini-open	No significant difference in pooled functional outcomes [8]
Huang et al. (2016)	Systematic review, 18 studies (4 RCTs), 1969-2015	Arthroscopic vs mini-open	Comparable outcomes except a small Constant score advantage for mini-open [10]
Boutros et al. (2026)	Meta-analysis of RCTs	Arthroscopic vs mini-open	Overall equivalence across the modern randomized trial base [11]
Gumina et al. (2007)	Cohort, massive tears	Open repair (deltoid takedown)	Deltoid detachment identified as a technique-specific complication of open exposure [2]

3. Comparative Functional and Patient-Reported Outcomes

The most methodologically rigorous head-to-head evidence comes from the JOINTS Canada multicenter

randomized trial, which enrolled 274 patients with full-thickness rotator cuff tears across nine centers and randomized them to all-arthroscopic or mini-open repair [6]. Disease-specific quality of life on the Western Ontario Rotator Cuff (WORC) index improved from a mean of 40 preoperatively to 89 in the all-arthroscopic group and 93 in the mini-open group at two years, an adjusted between-group difference of 3.4 points that fell within the trial's predefined margin for clinical equivalence; secondary measures of range of motion, strength, and pain showed only minor, clinically unremarkable differences between the two techniques, and postoperative opioid use fell sharply in both groups, from 21% to 5% of patients [6]. A companion meta-analysis pooling this and earlier randomized trials found no significant standardized mean difference between arthroscopic and mini-open repair across the combined trial evidence, reinforcing the single-trial finding at a larger scale [6].

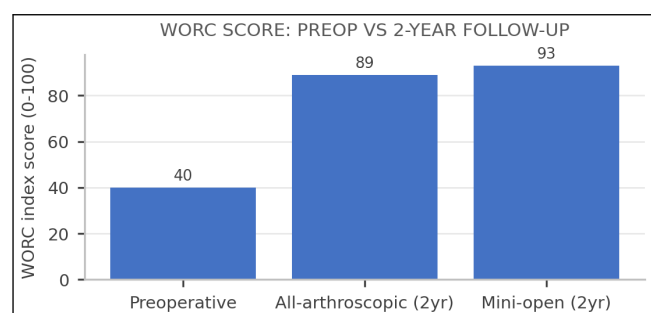


Figure 1: Western Ontario Rotator Cuff (WORC) index score before surgery and at 2-year follow-up in the JOINTS Canada multicenter randomized trial of all-arthroscopic versus mini-open rotator cuff repair (n=274), showing comparable improvement in both groups from a shared preoperative baseline [6].

Earlier randomized evidence is broadly consistent with this equivalence finding. A 100-patient randomized trial from the Netherlands comparing all-arthroscopic against mini-open repair of small- to medium-sized tears reported comparable clinical outcomes between groups at one-year follow-up [7], and a dedicated meta-analysis of the accumulated randomized trials available through 2014 likewise concluded that the two techniques produce statistically similar functional results [8]. A broader systematic review pooling 18 comparative studies, including four randomized trials published between 1969 and 2015, found that arthroscopic and mini-open repair performed comparably on functional outcome scores, range of motion, visual-analog pain scores, and general health-related quality of life, with the single exception

that the Constant-Murley shoulder score — the standard weighted composite of pain, activities of daily living, range of motion, and strength introduced by Constant and Murley [9] — showed a small advantage for mini-open repair in that pooled analysis [10]. A more recent systematic review and meta-analysis restricted specifically to randomized trials of arthroscopic versus mini-open repair reached a similar conclusion of overall equivalence across the modern trial base [11]. Independent of technique, interpreting any of these between-group differences requires attention to measurement precision: formal reliability analysis of the Constant score has established a minimal detectable change on the order of several points, meaning that small numeric differences between arthroscopic and open cohorts, of the size reported in several of the trials above, sit close to or within the instrument's own measurement noise [12]. A parallel synthesis focused specifically on pain, function, and motion likewise concluded that neither approach shows a consistent clinically important advantage over the other on patient-reported measures [13].

4. Complications, Retear Rates, and Technical Tradeoffs

Equivalent patient-reported outcomes do not by themselves establish that the two approaches are interchangeable, because the mechanisms of failure differ. Open repair's principal technique-specific risk is deltoid dysfunction from incomplete healing of the takedown or split, a complication that can produce persistent weakness and pain independent of whether the cuff tendon itself has healed [2]; arthroscopic and mini-open repair were designed specifically to avoid this risk by preserving the deltoid origin [3]. Structural failure of the repaired tendon — retear, evaluated by postoperative ultrasound or MRI — is the outcome most directly comparable across approaches, and a recent systematic review of retear after arthroscopic repair in middle-aged and older patients identified tear size, tendon retraction, muscle quality, and patient age as the dominant risk factors, factors that are properties of the tear and the patient rather than of whether the incision was open, mini-open, or fully arthroscopic [14]. Within the arthroscopic literature itself, footprint coverage and construct biomechanics, rather than the open-versus-arthroscopic distinction, appear to be the more consistent technical determinants of retear risk, as reflected in the parallel single-row-versus-double-row

comparative literature [4]. Taken together, the available evidence points toward tear characteristics and fixation construct, rather than incision size or arthroscopic versus open exposure per se, as the dominant drivers of structural healing, while deltoid-related morbidity remains a genuine, technique-specific cost that is largely confined to fully open exposure [2].

Rehabilitation Considerations Across Techniques

Because functional outcomes converge across exposures, postoperative rehabilitation protocol has drawn attention as a variable that may matter more than the incision itself. A systematic review of early passive motion versus initial immobilization after arthroscopic repair found that early controlled passive motion improved short-term range of motion without increasing retear rates in small to medium tears, while evidence in larger tears favored a more cautious, delayed approach [15]. A prospective randomized trial comparing early versus delayed physical therapy after arthroscopic repair similarly found that an accelerated protocol produced faster early motion gains without a difference in structural healing at final follow-up [16], suggesting that rehabilitation protocol, not incision type, may explain some of the modest between-study variation reported across technique comparisons [15,16].

5. Open Questions and Limitations of the Comparative Evidence

Several limitations temper how far this evidence base can be generalized. First, essentially none of the modern randomized trials compare arthroscopic repair against a truly open, deltoid-takedown approach; the dominant comparison in the contemporary literature is arthroscopic versus mini-open, because fully open repair had already become uncommon by the time large trials were funded [5,6]. Conclusions about "open" repair specifically therefore rest more on older cohort and complication literature, such as the deltoid detachment series [2], than on head-to-head randomized comparison. Second, most trials, including the largest one, were carried out in small to medium-sized, reparable tears; massive and irreparable tears, where exposure, mobilization, and margin convergence are technically more demanding, are underrepresented in the comparative trial base and may favor open exposure in ways the aggregate data cannot capture [6]. Third, surgeon experience and case volume

are consistently entangled with technique in observational data, and the randomized trials that control for this factor are still relatively few, limiting the precision of any claimed equivalence at the level of rare complications rather than mean functional scores [8,10]. Finally, the field would benefit from trials that report retear on standardized imaging protocols alongside patient-reported outcomes and directly quantify deltoid-related morbidity, since the current literature largely reports these as separate bodies of evidence rather than within the same comparative cohort [14,2].

6. Conclusion

Across the strongest available evidence — a large multicenter randomized trial and its accompanying meta-analysis, supported by earlier randomized trials and several independent systematic reviews — arthroscopic and mini-open rotator cuff repair produce statistically and, for most measures, clinically equivalent patient-reported functional outcomes at one to two years [6,7,8,10,11,13]. The choice between them is better framed as a tradeoff in technique-specific risk than as a question of which produces the better-healed shoulder: mini-open and all-arthroscopic techniques were developed specifically to avoid the deltoid-related morbidity that is a recognized cost of fully open exposure [2,3], while retear risk across all three exposures appears driven predominantly by tear size, tissue quality, and fixation construct rather than by incision size itself [14,4]. Given how little contemporary randomized evidence directly involves fully open repair, and how few trials report deltoid morbidity and retear within the same cohort, the most useful next step for this literature is not another arthroscopic-versus-mini-open equivalence trial but a comparative cohort that pairs standardized retear imaging with explicit deltoid-function outcomes across all three exposures, particularly in the massive and irreparable tears that the existing randomized base has largely excluded.

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Conflict of Interest

The authors have no conflicts of interest to declare relevant to this article.

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No new clinical or experimental data were generated for this short communication; all findings discussed are drawn from the cited published studies, which readers should consult directly for underlying data.

Ethical Approval

Not applicable. As a literature synthesis, this article did not involve human participants, animal subjects, or the collection of primary clinical data.

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