

General

The Outcomes of Arthroscopic Surgery for Patients with Shoulder Impingement Syndrome: A Systematic Review

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Objectives

To evaluate the outcomes of arthroscopic surgery for patients with shoulder impingement syndrome (SIS).

Methods

A systematic search was conducted in PubMed, Web of Science, SCOPUS, and Science Direct for studies on the outcomes of arthroscopic surgery for SIS. Screening, data extraction, and quality appraisal were performed independently.

Results

Eleven studies with a total of 782 patients were included. Arthroscopic subacromial decompression (ASAD) showed reduced pain and improved function regardless of age or chronicity, with high satisfaction rates and a low complication rate of 0-19.4%. Arthroscopic acromioplasty provided good short-term outcomes for refractory SIS and superior long-term outcomes compared to open surgery.

Conclusion

ASAD is more effective than open or conservative treatment for recalcitrant SIS, though similar results can be attained with well-structured exercise therapy. Low complication rates associated with arthroscopy underscore its safety.

Shoulder impingement syndrome (SIS) is a prevalent and painful condition that results from the compression of soft tissues in the subacromial space, leading to functional limitations and discomfort.¹ Conservative treatments are typically the first line of management; however, when these measures fail, arthroscopic surgery becomes a viable alternative. Arthroscopy enables minimally invasive diagnosis and treatment of both intra- and extra-articular shoulder pathologies through small incisions.²

Most studies report favorable outcomes of arthroscopic surgery for SIS, including reliable pain relief, functional improvement, and expedited return to activities compared to nonsurgical treatment.³ Additional arthroscopic benefits include lower complication rates and enhanced diagnostic capabilities compared to open surgery.⁴ However, outcomes are influenced by patient factors, impingement severity, and concomitant pathology.^{5,6} Given the complexity of SIS management decisions, an evidence synthesis is needed to clarify the role and expected outcomes of arthroscopic surgery. This systematic review aims to critically appraise the effectiveness, safety, and comparative efficacy of arthroscopic surgical interventions for SIS.

STUDY OBJECTIVES

- To assess postoperative pain relief and functional improvement in patients undergoing arthroscopic surgery for shoulder impingement syndrome.
- To evaluate the rates of complications and re-operation following arthroscopic surgery for shoulder impingement syndrome.
- To compare the outcomes of arthroscopic surgery with conservative treatments such as physical therapy or corticosteroid injections for shoulder impingement syndrome.

METHODS

This study adhered to the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)⁷ to systematically review the outcomes of arthroscopic surgery for patients with shoulder impingement syndrome. An electronic search was conducted on databases such as PubMed, Web of Science, SCOPUS, and

Science Direct to identify relevant studies in English that investigate the effectiveness and safety of arthroscopic surgery for shoulder impingement syndrome. The search strategy involved using keywords related to arthroscopic surgery and shoulder impingement syndrome outcomes. Two independent reviewers screened the search results, selected eligible studies, extracted data, and evaluated the quality of the included research using appropriate assessment tools.

ELIGIBILITY CRITERIA

INCLUSION CRITERIA

1. Studies that evaluate the outcomes of arthroscopic surgery for patients with shoulder impingement syndrome.
2. Studies that report on the effectiveness, safety, or comparative effectiveness of arthroscopic surgery for shoulder impingement syndrome.
3. Studies that include adult patients diagnosed with shoulder impingement syndrome.
4. Studies published in the English language.
5. Studies with available full-text articles.

EXCLUSION CRITERIA

1. Studies that do not specifically focus on arthroscopic surgery as an intervention for SIS.
2. Studies that only report on the surgical technique of arthroscopic surgery without outcome measures.
3. Studies that focus on pediatric patients or patients with a different shoulder pathology.
4. Studies published in languages other than English.
5. Conference abstracts, case reports, editorials, letters, and reviews that do not present original research data.

DATA EXTRACTION

To ensure accuracy and thoroughness, search results were managed using Rayyan (QCRI).⁸ Titles and abstracts of retrieved articles were screened for relevance based on the predefined inclusion and exclusion criteria. Studies meeting the inclusion criteria were subjected to full-text review by the research team. Discrepancies were resolved through consensus-based discussion. A standardized data extraction form was used to record key study information, including title, authors, publication year, study location, participant demographics, gender distribution, and outcomes related to arthroscopic surgery and shoulder impingement syndrome. A custom-designed assessment tool was employed to evaluate the risk of bias.

DATA SYNTHESIS STRATEGY

A qualitative synthesis of the research findings was performed using summary tables generated from the extracted data. Upon completion of data collection, the most appro-

priate approach for analyzing and presenting the data from the included studies was determined.

RISK OF BIAS ASSESSMENT

The methodological quality of included studies was assessed using the Joanna Briggs Institute (JBI) critical appraisal tool for prevalence studies.⁹ This nine-item checklist assigns a score of 1 for a positive response and 0 for a negative, unclear, or inapplicable response. Quality ratings were categorized as high (score > 8), moderate (score 5-7), or low (score < 4). Two researchers independently appraised study quality with disagreements resolved through discussion.

The risk of bias in randomized controlled trials was evaluated using the Cochrane Collaboration's Risk of Bias (ROB) tool.¹⁰ Results are visually presented in a color-coded table, with red indicating high risk of bias, green indicating low risk, and yellow indicating uncertain risk due to insufficient information.

RESULTS

SEARCH RESULTS

A comprehensive literature search yielded 820 potential study articles. After removing 398 duplicates, the titles and abstracts of 422 studies were screened for relevance, resulting in the exclusion of 382 articles. Two articles from the retrieved literature could not be accessed. The remaining 38 articles underwent full-text assessment, leading to the exclusion of 22 studies due to incorrect results, 6 studies due to inappropriate study designs, and 1 editor's letter. Ultimately, 11 research papers met the inclusion criteria and were included in this systematic review. Figure 1 illustrates the study selection process using a PRISMA flowchart.

CHARACTERISTICS OF THE INCLUDED STUDIES

Table (1) presents the sociodemographic characteristics of the included studies. The 11 studies comprised a total of 782 participants, with 360 (46%) being female. The studies were conducted across various countries, including Sweden (3 studies),¹¹⁻¹³ Finland (1 study),¹⁴ Pakistan (1 study),¹⁵ Norway (1 study),¹⁶ Germany (1 study),¹⁷ Malaysia (1 study),¹⁸ China (1 study),¹⁹ USA (1 study),²⁰ and India (1 study).²¹ The publication years ranged from 1996¹⁶ to 2021.¹⁴ The study designs included prospective cohorts (6 studies),^{11-13,18,20,21} randomized controlled trials (3 studies),^{14,17,19} a quasi-experimental study (1 study),¹⁵ and a retrospective cohort (1 study).¹⁶

Table (2) summarizes the clinical characteristics and outcomes of the included studies. Follow-up duration varied from 6 months^{15,16} to 12 years.¹² Three studies^{15,18,21} reported no complications following arthroscopic surgery, while two studies reported low complication rates of 5% for arthroscopic subacromial decompression (ASAD),¹⁴ 4% for diagnostic arthroscopy (DA),¹⁴ and 19.4% for arthroscopic acromioplasty.¹²

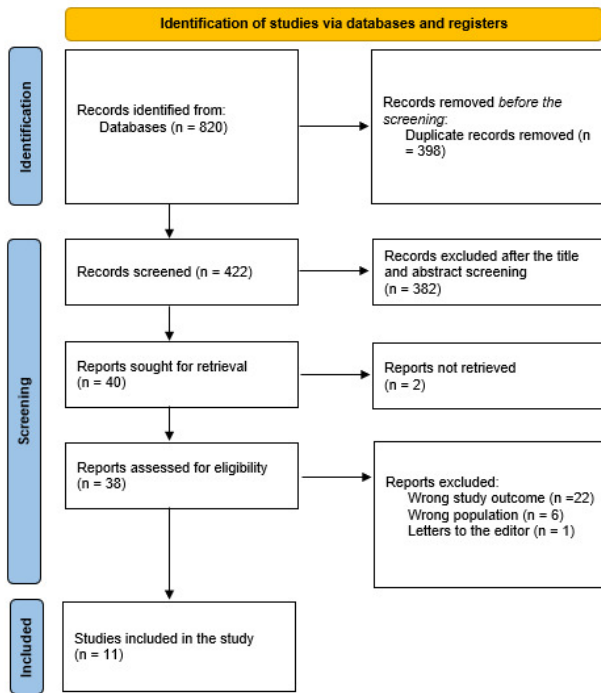


Figure (1). Study selection is summed up in a PRISMA flowchart.

Table (1). Sociodemographic characteristics of the included participants.

Study	Study design	Country	Participants	Mean age	Females (%)
Bäck et al., 2021 (a) ¹⁴	RCT	Finland	59	50.5 (7.3)	42 (71%)
Bäck et al., 2021 (b) ¹⁴	RCT	Finland	63	50.8 (7.6)	46 (73%)
Rehman et al., 2009 ¹⁵	Quasi-experimental study	Pakistan	30	38	13 (43%)
Brox & Brevik, 1996 ¹⁶	Retrospective cohort	Norway	114	48 (11.5)	50 (43.8%)
Lunsjö et al., 2011 ¹¹	Prospective cohort	Sweden	46	55	18 (39.1%)
KÖHLER et al., 2020 ¹⁷	RCT	Germany	106	45.4 (12.3)	25 (23.6%)
Shyamsundar & Pandey, 2012 ¹⁸	Prospective cohort	Malaysia	28	55.1	17 (61%)
Odenbring et al., 2008 ¹²	Prospective cohort	Sweden	31	51	7 (22.5%)
Lu et al., 2013 ¹⁹	RCT	China	32	50 ± 11.2	14 (43.8%)
Freedman et al., 1998 ²⁰	Prospective cohort	USA	203	48	92 (45.3%)
Bengtsson et al., 2006 ¹³	Prospective cohort	Sweden	50	49	29 (58%)
Khare et al., 2015 ²¹	Prospective cohort	India	20	39	7 (35%)

The findings suggest that ASAD is effective in reducing pain and improving function in patients with shoulder impingement syndrome (SIS) regardless of age or symptom duration.^{13-15,18,19,21} High long-term patient satisfaction was also reported following ASAD.^{11,13} Arthroscopic acromioplasty demonstrated good short-term outcomes for refractory or chronic SIS, with superior results compared to open acromioplasty over time.^{12,20}

The methodological quality of the included studies was assessed using the Joanna Briggs Institute (JBI) critical ap-

praisal tool, with scores categorized as low (<4), moderate (5-7), or high (>8). The risk of bias in randomized controlled trials was evaluated using the Cochrane Collaboration's Risk of Bias (ROB) tool, with results presented in color-coded tables (Figures 2 and 3).

DISCUSSION

Shoulder impingement syndrome (SIS) is a debilitating shoulder condition with an oftentimes complex and contro-

Table (2). Clinical characteristics and outcomes of the included studies.

Study	Follow-up (years)	Intervention	Complications (%)	Main outcomes	JB1
Bäck et al., 2021 (a) ¹⁴	5	ASAD	3 (5%)	In terms of all the outcomes evaluated at the conclusion of a 5-year follow-up period, ASAD was not superior to diagnostic arthroscopy. The patients assigned to ASAD did not show any clinically meaningful improvement over those allocated to diagnostic arthroscopy, despite the fact that both groups showed considerable improvement in both primary outcomes.	NA**
Bäck et al., 2021 (b) ¹⁴	5	DA	3 (4%)		
Rehman et al., 2009 ¹⁵	0.5	ASAD	0	For SIS patients, ASAD is useful in lowering pain and enhancing function. The procedure is beneficial to individuals of any age, regardless of how long their symptoms have been present.	
Brox & Brevik, 1996 ¹⁶	0.5	Arthroscopic acromion resection vs placebo laser or withdrawing from active treatment	NM	A more limited prescription for medicine, active management (arthroscopic acromion resection), and sick leave all enhance the prognosis for rotator tendinopathy.	Moderate
Lunsjö et al., 2011 ¹¹	6	ASAD	NM	After carefully selecting the right patient, skilled shoulder surgeons can achieve high patient satisfaction with ASAD for impingement, which lasts for at least six years following surgery.	Moderate
KÖHLER et al., 2020 ¹⁷	1	Physiotherapy vs ASAD	NM	Similar results for shoulder discomfort and function were obtained with conservative and surgical therapy of SIS at 3, 6, and 12 months following intervention. Conversely, patients who received conservative care resumed their jobs far sooner than those who had surgery.	NA*
Shyamsundar & Pandey, 2012 ¹⁸	1	ASAD	0	Based on the significant improvements in functional, clinical, and radiological indicators, ASAD was determined to be an effective strategy for treating patients with shoulder impingement.	Moderate
Odenbring et al., 2008 ¹²	12	Arthroscopic acromioplasty	6 (19.4%)	Up to a minimum of 12 years after surgery, arthroscopic acromioplasty produced good short-term results, with excellent or good outcomes seen in 77% of shoulders. Over time, arthroscopic acromioplasty appears to produce better results than open acromioplasty.	Moderate
Lu et al., 2013 ¹⁹	1	ASAD	NM	For rotator cuff tendinosis and refractory SIS without a tendon tear, ASAD is a dependable treatment.	NA
Freedman et al., 1998 ²⁰	3	Arthroscopic acromioplasty	NM	Patients with a history of shoulder arthroplasty may benefit from arthroscopic acromioplasty as an effective treatment for refractory impingement syndrome. A thorough preoperative workup needs to rule out any alternative causes of the excruciating shoulder replacement.	High

Study	Follow-up (years)	Intervention	Complications (%)	Main outcomes	JB1
Bengtsson et al., 2006 ¹³	0.5	ASAD	NM	Six months following surgery, ASAD for impingement performed by skilled surgeons on carefully chosen patients results in a high degree of patient satisfaction.	Moderate
Khare et al., 2015 ²¹	0.5	ASAD	0	The surgery helped individuals who had not responded to conservative treatment. Following surgery, early 90% of patients indicated that their symptoms had improved, they felt better, and their range of motion and strength of forward flexion had increased. The pain also decreased and the shoulder's functional capacity enhanced.	Moderate

**NA=Not-applicable

*NM=Not-mentioned

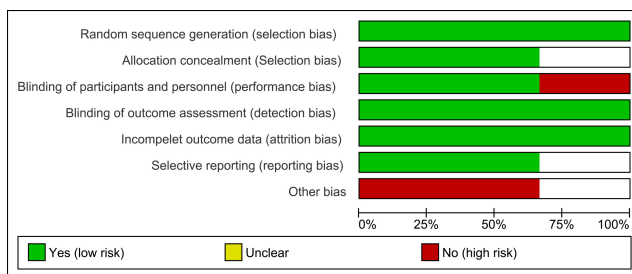


Figure (2). Risk of bias graph.

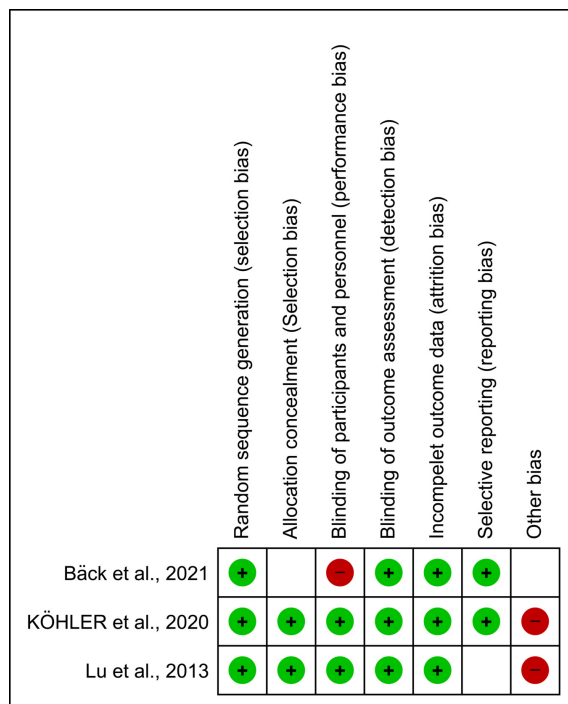


Figure (3). Risk of bias summary.

versal treatment course. Nonoperative strategies are first-line, but their efficacy is not universally durable.

Arthroscopy has emerged as a promising surgical alternative to open procedures, offering a minimally invasive approach to addressing shoulder pathology. However, its role and relative benefits for SIS remain incompletely defined.

This systematic review synthesizes available evidence on arthroscopic surgery outcomes for SIS, finding generally positive results. ASAD appears to yield meaningful improvements in pain and function for patients across age groups and symptom chronicity,^{13-15,18,19,21} with two studies supporting sustained patient satisfaction.^{11,13} Arthroscopic acromioplasty outcomes were superior to open surgery for refractory SIS cases, particularly long-term.^{12,20}

These findings align with a meta-analysis by Liu et al. which found comparable clinical outcomes between arthroscopic decompression and conservative care for SIS, leading the authors to recommend initial nonoperative management with consideration of arthroscopy if symptoms persist.²² Similarly, Dong et al. advised that surgical options may be entertained for chronic SIS, with ASAD preferred over bursectomy or open decompression.²³

The current review reinforces arthroscopy as a viable treatment for SIS refractory to conservative care, as it enables comprehensive diagnostic evaluation and therapeutic flexibility. Systematic reviews have found no clear differences in outcomes between ASAD and bursectomy²⁴ or open decompression,²⁵ nor definitive superiority of any surgical approach to nonoperative treatment.²⁶ This equivalence underscores the need for judicious patient selection and an individualized stepwise treatment approach incorporating both surgical and nonsurgical modalities.

The low complication rate associated with arthroscopic surgery for SIS is encouraging, mirroring the safety profile reported in the broader arthroscopy literature. Observed complications, most frequently stiffness and capsulitis, appear amenable to conservative treatment and self-resolve. Careful patient selection, meticulous surgical technique, and specialized surgeon training likely contribute to these favorable safety outcomes.

Despite the apparent benefits of arthroscopic surgery for SIS, several knowledge gaps persist. Foremost is the lack of

high-quality comparative effectiveness data across the clinical spectrum of SIS. Trials evaluating arthroscopic surgery against both nonoperative regimens and alternate surgical approaches, stratified by impingement etiology and severity, could refine indications and identify subpopulations likely to derive the greatest benefit.

Standardization of conservative treatment protocols and outcome assessment instruments is also critical. Establishing a benchmark nonoperative regimen would enhance study comparability and applicability to clinical practice. Consistent use of validated patient-reported outcome measures and quality of life instruments could improve documentation of the subjective patient experience.

Cost-effectiveness is another key consideration, as the rising utilization of arthroscopy for SIS carries significant economic implications. Robust economic evaluations, ideally conducted alongside clinical trials, are needed to quantify the incremental benefits of arthroscopy relative to alternative treatment approaches. These analyses should adopt both healthcare sector and societal perspectives to capture direct and indirect costs.

Finally, the optimal postoperative rehabilitation approach for arthroscopic SIS surgery remains undetermined. Trials comparing different exercise modalities, progressions, and intensities could help maximize recovery and functional outcomes. The efficacy of additional conservative adjuncts such as manual therapy and electrotherapeutic modalities also merits further exploration.

LIMITATIONS OF THIS REVIEW

This review is not without limitations. The heterogeneity of included studies in terms of design, population, intervention, and outcome measures precludes a meta-analysis.

The preponderance of observational studies limits causal inferences. Small sample sizes and inadequate follow-up in some studies may compromise the reliability and generalizability of findings.

Nonetheless, this review provides a comprehensive synthesis of current evidence on arthroscopic surgery outcomes for SIS. The robust search strategy, systematic screening and data extraction methodology, and application of validated quality appraisal tools enhance the validity of findings.

CONCLUSION

Arthroscopic surgery, particularly subacromial decompression, appears to be a safe and effective treatment option for SIS refractory to conservative management. Available evidence suggests arthroscopic approaches yield meaningful improvements in pain and function, high patient satisfaction, and lower complication rates compared to open surgery. However, comparable outcomes may be attainable through well-structured exercise therapy, emphasizing the importance of exhausting nonoperative options before considering surgery.

Opportunities for future research include high-quality randomized trials comparing arthroscopy to alternative treatments across the SIS spectrum, economic evaluations to establish cost-effectiveness, and studies optimizing postoperative rehabilitation. Consistent use of validated outcome measures and longer-term follow-up would strengthen the evidence base.

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