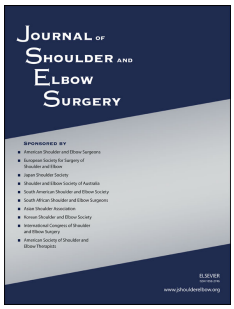
Journal Pre-proof



Short and Long-Term Outcomes in Bankart Repair Versus Conservative Treatment for First-Time Anterior Shoulder Dislocation: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

Nedal Alkhatib, MD, Abdullah Saad A. Abdullah, MD, Mason AlNouri, MD, Osama Zied Ahmad Alzobi, MD, Eslam Alkaramany, MD, Yasuyuki Ishibashi, MD, PhD

PII: S1058-2746(22)00341-X

DOI: https://doi.org/10.1016/j.jse.2022.02.032

Reference: YMSE 5949

To appear in: *Journal of Shoulder and Elbow Surgery*

Received Date: 30 September 2021

Revised Date: 12 February 2022

Accepted Date: 24 February 2022

Please cite this article as: Alkhatib N, Abdullah ASA, AlNouri M, Ahmad Alzobi OZ, Alkaramany E, Ishibashi Y, Short and Long-Term Outcomes in Bankart Repair Versus Conservative Treatment for First-Time Anterior Shoulder Dislocation: A Systematic Review and Meta-Analysis of Randomized Controlled Trials, *Journal of Shoulder and Elbow Surgery* (2022), doi: https://doi.org/10.1016/j.jse.2022.02.032.

Short and Long-Term Outcomes in Bankart Repair Versus Conservative Treatment for First-Time Anterior Shoulder Dislocation: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

Nedal Alkhatib, MD [a]

Abdullah Saad A. Abdullah, MD [b]

Mason AlNouri, MD [c]

Osama Zied Ahmad Alzobi, MD [d]

Eslam Alkaramany, MD [d]

Yasuyuki Ishibashi, MD, PhD [c]

[a] Division of Orthopaedic Surgery, Dalhousie University, Halifax, NS, Canada

[b] Division of Orthopaedic Surgery, University Health Network, Toronto Western Hospital, Toronto, ON, Canada

[c] Department of Orthopaedic Surgery, Graduate School of Medicine, Hirosaki University, Hirosaki, Aomori, Japan

[d] Orthopaedic Surgery Department, Hamad Medical Corporation, Doha, Qatar

Corresponding Author: Abdullah Saad A. Abdullah, MD
Address: Division of Orthopaedic Surgery, Toronto Western Hospital, 399 Bathurst St, Toronto, ON M5T 2S8, Canada
Telephone: +1-647-909-8157; **E-mail:** abdullahsaad21@gmail.com

Institutional review approval was not required for this study.

Running Title: Short and Long-term Outcomes Meta-Analysis

Disclaimers:

Funding: No funding was disclosed by the authors.

Conflicts of interest: The authors, their immediate families, and any research foundation with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

Abstract

Background

First-time anterior shoulder dislocations are associated with a high rate of residual instability. Therefore, many surgeons support initial Bankart repair surgery over conservative management to address this issue. However, the optimal treatment remains controversial due to uncertainty regarding long-term surgical outcomes. The primary objective of this systematic review and meta-analysis was to compare the short and long-term rates of residual instability following Bankart repair or conservative management, after a first-time anterior shoulder dislocation.

Methods

PubMed/MEDLINE, Embase, The Cochrane Library, Web of Science, CINAHL, and ScienceDirect databases were accessed for randomized controlled trials (RCTs) comparing Bankart repair to conservative management. RoB (Risk of Bias) 2 was utilized to check study quality. The Grading of Recommendations, Assessment, Development and Evaluation (GRADE) guidelines were followed in assessing primary outcomes. The Inverse-Variance method for continuous variables, and the Mantel-Haenszel method for dichotomous variables was used.

Results

348 patients from 6 RCTs published across 8 articles, with a mean age of 23.7, were included. Bias was graded “Low” in 3 studies, “Some concerns” in 3 studies and “High” in 2 studies. In the short-term(2-3years), surgery lowered recurrent instability (Risk Ratio (RR),0.15;95%CI,0.08-0.27; I^2=0%;P<.0001). Similar findings were seen in the long-term (5-12 years) (RR,0.23;95%CI,0.14-0.39;I^2=0%;P<.0001). No difference was observed in “return to sport” (RR,1.18;95%CI,0.91-1.52;I^2=78%;P=0.21). Initial surgery lowered subsequent stabilization surgery in the short (RR,0.19;95%CI, 0.09-0.43; I^2=0%; P<.0001) and long-term

(RR,0.17;95%CI,0.07-0.39;I^2=25%;P<.0001). Western Ontario Shoulder Instability Index (WOSI) scores did not differ in the short-term (MD,2.54;95%CI,-0.51–5.59;I%=48%;P=0.1), but were higher in the surgical group at long-term follow-up. Patient satisfaction was also higher with surgery (RR,1.75;95%CI,1.4–2.2;I^2=88%;P<.0001). Certainty of evidence was low for only 1 long-term outcome measure.

Conclusion

Bankart repair surgery for first-time anterior shoulder dislocation results in a large reduction in the risk of recurrent shoulder instability and subsequent stabilization surgery, in both short (2-3 years) and long-term (5-12 years) follow-up intervals. Additionally, slight improvements in overall patient satisfaction and WOSI score can be seen at long-term follow-up. However, surgical intervention failed to significantly improve the rate of "return to sport", when compared to conservative management.

Level of Evidence: Level II; Meta-Analysis

Keywords: First-time, shoulder, dislocation, Bankart repair, surgery, conservative, treatment

The glenohumeral joint has the greatest range of motion among all joints in the body, making it the most susceptible to dislocations.[30] Anterior traumatic dislocations of the glenohumeral joint occur in many different sports, and are more commonly seen in young active males.[26] The frequency of shoulder dislocation varies depending on the population studied, with annual estimates ranging between 11 and 51 per 100,000 people.[13,14,30] Unfortunately, primary dislocations are associated with a high risk of instability in over 50% of cases.[22] Bankart lesions,

47 including associated capsulolabral pathologies, can be observed arthroscopically in almost all
48 anterior shoulder dislocation cases, which may explain the high rate of residual instability and re-
49 dislocations.[6]
50
51 The optimal management of glenohumeral instability following the first dislocation, continues to
52 be a topic of debate among shoulder surgeons.[5,8] The most widely used options for management
53 are: arthroscopic labral stabilization, more commonly known as Bankart repair, and joint
54 immobilization followed by physiotherapy.[4] The recently published meta-analysis by Hurley et
55 al showed that surgical intervention is superior to conservative management in decreasing
56 reoperations, improving "return to sport", and lowering recurrent instability with rates of 9.7%
57 after surgical intervention, compared to 67.4% after conservative treatment.[8] On that basis, the
58 evidence supporting surgical intervention for first-time dislocations is overwhelming. However,
59 the long-term effects of this treatment option, versus conservative management, are not well
60 established.
61
62 A systematic review by Murphy et al examined long-term outcomes following Bankart repair
63 surgeries and concluded that instability recurred at a rate of 31.2%, while re-dislocations
64 recurred 16.0% of the time.[18] However, the study was not restricted to Bankart repairs for first-
65 time dislocations; therefore, as expected, this figure was higher than that found in the Hurley et
66 al study. Additionally, evidence of arthropathy was observed in 59.4% of patients who
67 underwent surgical stabilization.[18] These findings continue to cast doubt on surgery being the
68 best choice for first-time dislocations, especially since differences between long-term outcomes
69 of surgical and conservative treatments, and between long-term outcomes for first-time

dislocations and recurrent dislocations are unknown. A recently published cohort study compared results after Latarjet procedures in first-time versus recurrent dislocations and found no significant differences in residual instability for up to 2 years after surgery.[7] Therefore, it is possible that a similar outcome would be seen with Bankart repair surgeries.

Three new randomized controlled trials (RCTs) have been published on the topic of labral stabilization versus conservative management, for first-time dislocations. While most agreed with the significant advantage of surgery in lowering instability, Minkus et al concluded no significant differences in shoulder scores and Yapp et al found long-term improvements in function and instability rate.[17,21,29] In order to addresses residual concerns about the best method of treatment in the long-term, newer evidence should be examined and compared. The primary objective of this systematic review and meta-analysis was to compare the short and long-term rates of residual instability with Bankart repair versus conservative management, after a first-time anterior shoulder dislocation. The secondary objective was to compare other outcomes including the need for subsequent stabilization surgery, rate of "return to sports", Western Ontario Shoulder Instability Index (WOSI) score[10], and degree of patient satisfaction. The hypothesis was that Bankart repair would result in lower rates of recurrent instability, better functional outcomes, lower rates of subsequent surgery, and higher rates of "return to sport", compared to conservative management both in the short and long-term.

Materials and Methods

Study Criteria

Studies were gathered based on the following criteria. Inclusion criteria: studies comparing labral stabilization to conservative management for patients with first-time shoulder dislocations,

randomized controlled trials, a minimum of two stated outcomes, and a minimum 2 years of follow-up. Exclusion criteria: non-randomized cohorts, letter publications, abstract-only publications, commentaries, published case reports, non-human subjects and reviews.

Search Information

This study adhered to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines for its protocols.[15,25]The search was performed on 2021/04/04 at these databases: PubMed/MEDLINE, Embase, The Cochrane Library, Web of Science, CINAHL, and ScienceDirect using the search query (((Shoulder) AND (dislocation OR Instability)) AND (Arthro* OR Surg*)) AND (Random*) AND ((first OR Initial)) where "OR", "AND" were Boolean operators. All filters were deactivated for the search, while all available years and fields were included. Article references were also checked manually to help capture all available related publications.

Selection of Studies

Results from all searches were pooled and then independently screened for eligibility by (EA) and (NA). Author (AA) helped resolve any disagreement, during a meeting with the screening authors, by listening to argument points and facilitating discussions until a consensus was reached. The screening process involved checking abstracts for each result. After initial screening and duplicate elimination, remaining studies of interest received a full-text review in order to determine eligibility for inclusion.

Extraction of Data

Extracting data from selected articles was also done independently by authors (NA) and (EA). A standardized template spreadsheet was utilized by each author, in order to ensure accurate entry. The extracted items were: first author's name, publication year, study design, exclusion criteria, sample size, age, duration of follow-up, study's exclusion criteria, repair type, subsequent instability, requirement of another surgery, "return to sport", WOSI scores with intervals, and patient satisfaction.

Risk of Bias and Quality of Outcomes

The Risk of Bias 2 (RoB 2) tool[27] was selected and used to assess the risk of bias within and across included studies. RoB 2 gives an assessment in each of these domains: randomization, drift from intended interventions, missing result data, outcome measurements and selective result reporting. A choice between 3 ratings can be selected, which are: "Low", "Some concerns" or "High".[27] Graphical representations of bias were created using the robvis (https://mcguinlu.shinyapps.io/robvis/) utility.[16] The Grading of Recommendations, Assessment, Development and Evaluation (GRADE) guidelines[24] were followed to determine the strength of evidence for outcomes using the GRADEpro Guideline Development Tool (McMaster University & Evidence Prime, 2020, https://gradepro.org). Authors (NA) and (OA) independently completed the RoB 2 and GRADE assessments. Disagreements in ratings were resolved with the help of author (AA) in a similar fashion as stated previously.

Statistical Analysis

The Review Manager software (Revman version 5.4.1, The Cochrane Collaboration) was

selected and used for pooled analyses. The I^2 statistic assessed statistical heterogeneity across different studies, with the following range definitions: 0% to 40% "possibly not important", 30% to 60% "possibly moderate heterogeneity", 50% to 90% "possibly substantial heterogeneity", and 75% to 100% "considerable heterogeneity". The Inverse-Variance method was used to assess mean differences for continuous variables, while the Mantel-Haenszel method was used for dichotomous variables in risk and odds ratio analyses. The random effects model was used if heterogeneity was deemed significant (I^2>=50% or P<0.1); otherwise, the fixed effect model was selected. In order to ensure the availability of comparable data, authors of included studies were contacted to provide raw data where necessary. Some raw values were converted as deemed appropriate for a homogeneous analysis. WOSI scores were converted to percentages, where 0% indicated the worst possible shoulder function, and 100% indicated the best function. A minimum of two included studies was set as a requirement for pooling data quantitatively. A p-value of 0.05 was considered statistically significant.

Results

Study Search and Selection

The initial database and manual search yielded 360 documents; of those, 160 duplicates were identified and removed, leaving 200 for the screening process. Documents were then screened, giving 13 articles for full-text review. After applying the defined inclusion and exclusion criteria, 5 articles were excluded and 8 studies[2,9,11,12,17,21,23,29] remained for the analysis. The PRISMA search flowchart is shown in Figure 1.

Study Characteristics

A total of 348 patients, with first-time traumatic anterior shoulder dislocations, from a total of 6 RCTs, were included in the meta-analysis. 170 of those were randomized to receive Bankart repair surgery, while the remaining 178 patients were treated conservatively. The follow-up duration ranged from 2 to 12 years. The mean age of all participants was 23.7 years (24.2 years in the surgical group and 23.2 years in the conservative group). 87.9% of patients who underwent surgery, and 90.7% of those treated conservatively were males. All the RCTs utilized arthroscopic surgical repair for the intervention group, with the exception of Jakobsen et al, who used an open repair technique.[9] Jakobsen et al included both short-term and long-term follow-up patients.[9] Kirkley et al published a long-term follow-up study, in 2005[12], of the same subjects who were enrolled in the initial 1999[11] study. Similarly, Yapp et al[29] recently published the long-term follow-up data of study participants from the 2008 Robinson et al[23] study. Important characteristics for all included RCTs are displayed Tables 1 and 2.

Risk of Bias and GRADE Analysis

Figure 2 shows a visual summary of the risk of bias analysis within and across all included studies. The Kirkley et al[11,12] studies had a low risk of bias for both short and long-term analyses. On the other hand, Robinson et al[23] received a low rating for risk of bias in their short-term study but the long-term follow-up, published by Yapp et al[29], exhibited a high risk of bias rating due to a 26% loss of follow-up. Minkus et al[17], was also found to have a high risk of bias due serious concerns with blinding. Three studies[2,9,21] had some concerns of bias in their measured outcomes due to missing details about blinding. Table 3 includes the GRADE summary for all outcome variables. Certainty of evidence was low for only the long-term subsequent stabilization surgery

outcome, while it was moderate for the short-term recurrent instability outcome, and high in all other remaining outcomes.

Pooled Outcomes

In the short-term (2-3 years) follow-up period, recurrent instability was reported in 6 studies[2,9,11,17,21,23] with a total of 348 patients. 11 out of 170 patients (6.5%) experienced recurrent instability and were treated with surgery, while 78 out of 178 patients (44%) were treated conservatively. In the short-term, surgical repair resulted in a large reduction in risk of recurrent instability (Risk Ratio (RR), 0.15; 95% CI, 0.08-0.27; $I^2 = 0\%$; $P < .0001$) (Figure 3). For the long-term (5-12 years) analysis, 171 patients from 3 studies[9,11,29]were available. 13 out of 85 patients (15%) treated with surgery, had recurrent instability, whereas 56 out of 86 patients (65%) in the conservative group, had experienced recurrent instability. A large reduction in the risk of recurrent instability (RR, 0.23; 95% CI, 0.14-0.39; $I^2 = 0\%$; $P < .0001$) (Figure 4) was also observed with surgical intervention for long-term follow-up.

"Return to sport" was reported in 4 studies[2,12,21,23] with a total of 155 patients. 70 out of 76 patients (92%), returned to sports in the surgical repair group, while 58 out of 79 patients (73%), returned to sports in the conservative group. No statistically significant difference was seen in "return to sport" between both groups (RR, 1.18; 95% CI, 0.91-1.52; $I^2 = 78\%$; $P = 0.21$) (Figure 5).

Subsequent surgery in the short-term (2-3 years) follow-up period was reported in 5 studies[2,11,17,21,23] with a total of 272 patients. 6 out of 133 patients (4.5%) treated with surgery,

208 required subsequent surgery, whereas 35 out of 139 patients (25.2%) who were treated
209 conservatively, required subsequent surgical stabilization. Pooled data showed that initial surgery
210 reduces the risk of subsequent stabilization surgery (RR, 0.19; 95% CI, 0.09-0.43; $I^2 = 0\%$; $P <$
211 .0001) (Figure 6). Regarding long-term follow-up, a total of 171 patients from 3 studies[9,12,29]
212 were included, and one study[9] did not report short-term results. 6 out of 85 patients (5.8%)
213 treated with surgery, underwent further surgical stabilization, while 35 out of 86 patients (40.7%)
214 treated conservatively, underwent subsequent stabilization surgery. A significant reduction in
215 risk of subsequent stabilization in the long-term, was therefore observed (RR, 0.17; 95% CI,
216 0.07-0.39; $I^2 = 25\%$; $P < .0001$) (Figure 7).
217
218 WOSI scores were reported, during short-term (2-3 years) follow-up, in 4 studies[11,17,21,23]with a
219 total of 251 patients. No significant differences were seen in short-term WOSI scores between
220 both groups (MD, 2.54; 95% CI, -0.51-5.59; I% = 48%; P = 0.1) (Figure 8). As for long-term (5-
221 12 years) follow-up, WOSI scores were reported in only 2 studies[12,29] with total of 96 patients.
222 Initial surgery was found to slightly improve long-term WOSI scores compared to conservative
223 treatment (MD, 7.03; 95% CI, 1.51-12.55; I% = 0%; P = 0.01) (Figure 9).
224
225 Patient satisfaction was reported in 3 studies[2,21,23] with 141 patients in total. 63 out of 69 patients
226 (91.3%) in the surgery group, were satisfied with their outcomes, whereas 37 out of 72 patients
227 (51.4%) in the conservative group, were satisfied with their outcomes. Therefore, surgery was
228 found to improve patient satisfaction compared to conservative management (RR, 1.75; 95% CI,
229 1.4-2.2; $I^2 = 88\%$; $P < .0001$) (Figure 10).
230

Heterogeneity was "possibly not important" for the following outcomes: recurrent instability both short and long-term, subsequent stabilization surgery both short and long-term, and long-term WOSI score. A rating of "possibly moderate heterogeneity" was given to the short-term WOSI score outcome, while "return to sport" was rated as "possibly substantial heterogeneity", and patient satisfaction was deemed to have "considerable heterogeneity".

Discussion

This study showed that first-time anterior shoulder dislocations have better short-term and long-term outcomes when treated with Bankart repair surgery versus conservative management. Recurrence rates of instability were 7 times less at short-term follow-up and 4 times less at long-term follow-up. Additionally, patients treated with Bankart repair surgery had fewer subsequent stabilization surgeries, by about 5 times, compared to those treated conservatively. Satisfaction rates were also twice better with surgery than conservative management. However, no significant differences in "return to sport" was seen between both groups.

The recurrent rate of shoulder instability was observed to be less in the Bankart group compared to the conservative group, (6.5 % versus 43.8 %) and (15.2 % versus 65.1 %), in short and long-term follow-up, respectively. The result is therefore in agreement with Hurley et al and Chahal et al for short-term recurrence.[3,8] Moreover, this result is maintained even in the long-term. On that basis, it appears than Bankart repair surgery alone may be an effective modality for preventing recurrent shoulder instability both in the short and long-term, following a first-time anterior shoulder dislocation.

The results also demonstrated a significantly lower rate of subsequent stabilization surgeries following Bankart repair versus conservative management, (4.5 % versus 25%) and (7% versus 41 %), in short and long-term follow-up, respectively. Pooled short-term results are again similar to what was observed in the Hurley et al study.[8] This finding continued to be seen in the long-term and was again higher in the conservative group. Interestingly, the need for subsequent surgery to treat instability, be it soft tissue or bony procedures, continued to increase over time in both groups; although this increase was much higher in the conservative group, and only slightly higher in the surgical group. This new evidence can be utilized for counseling patients with first-time shoulder dislocation who are hesitant to undergo surgery due to fears about long-term outcomes and future revisions.

Patient satisfaction was also found to be consistently higher following Bankart repair compared to conservative management. This outcome measure was assessed by asking patients, at final follow-up, if they would accept the same treatment modality if able to go back in time and reselect. Chahal et al reported on satisfaction rates but did not demonstrate a significant difference in their meta-analysis.[3] However, pooling of results from the new RCTs increased data available on patient satisfaction, and hence revealed that a significant difference indeed exists.

Although patients in the surgical Bankart repair group were found have higher rates of “return to sport” than the conservative group (92% versus 73%), the result was not statistically significant. Hurley et al demonstrated a significant difference in “return to sport” between surgery and conservative management, with results favoring Bankart repair.[8] It is possible that differences in defining “return to sport” may have affected results. Nonetheless, this finding is important in the

counseling process, since "return to sport" may significantly impact a patient's decision to proceed with a certain treatment modality.[28]

This study was able to analyze WOSI score data, which was not previously pooled or reported by any other meta-analysis.[1,3,8] The WOSI score was found to be significantly better in the surgical Bankart repair group during long-term follow-up, with improvements reaching a mean difference of 7%. The difference in WOSI scores can be considered clinically relevant due to its proximity to the minimal clinically important difference (MCID), which is 7.2% after conversion.[19] However, this was not demonstrated during the short-term follow-up period.

High heterogeneity was seen in "return to sport", patient satisfaction and in the short-term WOSI score. The reasons for this are difficult to pinpoint; however, for "return to sport" this could be due to a difference in treatment and decision factors for when to return to the sport, which may or may not be at a competitive level. It may also be a result of different types of sports being played by the many included patients. Patient satisfaction is also an outcome which may be open to different methods of evaluation and interpretation, keeping in mind the various differences in surgical techniques and immobilization time periods and protocols. On the other hand, heterogeneity was significantly low for: recurrent shoulder instability, subsequent surgical stabilization and, long-term WOSI score, likely due to their more objective nature and ease of measurement. In regards to the GRADE analysis results, most outcomes exhibited a high degree of confidence with the exception of subsequent stabilization in the long-term, where it was found to be low. It is possible that the low number of studies contributed to this result, especially for outcomes where sample sizes were limited.

Limitations

The main limitations of this study are: The number of available RCTs for inclusion, while improved since previous meta-analyses, is still low. The inability to stratify outcomes based on age, sex, level of sports activity, all of which are important risk factors for recurrent shoulder dislocations.[20] The difficulty in assessing the impact of shoulder dislocation associated lesions, such as: bony Bankart, chondral lesions, and other capsular pathologies on different outcomes. The possibly substantial heterogeneity in a few of the pooled outcomes ("return to sport", patient satisfaction, and WOSI score at short-term follow-up). The existence of different treatment protocols and different patient reported outcome measures, across all included studies, in both the surgical and conservative groups, which may have introduced some bias in the results. The wide range of follow-up intervals, which would make it difficult to give exact timeframes when discussing the evidence, especially for long-term outcomes. The loss of follow-up for some patients in the long-term analysis, potentially leaving out important data.

Conclusion

Bankart repair surgery for first-time anterior shoulder dislocation results in a large reduction in the risk of recurrent shoulder instability and subsequent stabilization surgery, in both short (2-3 years) and long-term (5-12 years) follow-up intervals. Additionally, slight improvements in overall patient satisfaction and WOSI score can be seen at long-term follow-up. However, surgical intervention failed to significantly improve the rate of "return to sport", when compared to conservative management.

References

1. Adam M, Attia AK, Alhammoud A, Aldahamsheh O, Al Ateeq Al Dosari M, Ahmed G. Arthroscopic Bankart repair for the acute anterior shoulder dislocation: systematic review and meta-analysis. Int Orthop. 2018 Oct;42(10):2413–2422. doi:10.1007/s00264-018-4046-0

2. Bottoni CR, Wilckens JH, DeBerardino TM, D'Alleyrand J-CG, Rooney RC, Harpstrite JK, et al. A prospective, randomized evaluation of arthroscopic stabilization versus nonoperative treatment in patients with acute, traumatic, first-time shoulder dislocations. Am J Sports Med. 2002 Aug;30(4):576–580. doi:10.1177/03635465020300041801

3. Chahal J, Marks PH, Macdonald PB, Shah PS, Theodoropoulos J, Ravi B, et al. Anatomic Bankart repair compared with nonoperative treatment and/or arthroscopic lavage for first-time traumatic shoulder dislocation. Arthroscopy. 2012 Apr;28(4):565–575. doi:10.1016/j.arthro.2011.11.012

4. Garcia GH, Taylor SA, Fabricant PD, Dines JS. Shoulder Instability Management: A Survey of the American Shoulder and Elbow Surgeons. Am J Orthop (Belle Mead NJ). 2016 Apr;45(3):E91-97. No doi

5. Grumet RC, Bach BR, Provencher MT. Arthroscopic stabilization for first-time versus recurrent shoulder instability. Arthroscopy. 2010 Feb;26(2):239–248. doi:10.1016/j.arthro.2009.06.006

6. Gutierrez V, Monckeberg JE, Pinedo M, Radice F. Arthroscopically determined degree of injury after shoulder dislocation relates to recurrence rate. Clin Orthop Relat Res. 2012 Apr;470(4):961–964. doi:10.1007/s11999-011-2229-8

7. Hardy A, Sabatier V, Laboudie P, Schoch B, Nourissat G, Valenti P, et al. Outcomes After Latarjet Procedure: Patients With First-Time Versus Recurrent Dislocations. Am J Sports Med. 2020 Jan;48(1):21–26. doi:10.1177/0363546519879929

8. Hurley ET, Manjunath AK, Bloom DA, Pauzenberger L, Mullett H, Alaia MJ, et al. Arthroscopic Bankart Repair Versus Conservative Management for First-Time Traumatic

Anterior Shoulder Instability: A Systematic Review and Meta-analysis. Arthroscopy. 2020 Sep;36(9):2526–2532. doi:10.1016/j.arthro.2020.04.046

9. Jakobsen BW, Johannsen HV, Suder P, Søjbjerg JO. Primary repair versus conservative treatment of first-time traumatic anterior dislocation of the shoulder: a randomized study with 10-year follow-up. Arthroscopy. 2007 Feb;23(2):118–123. doi:10.1016/j.arthro.2006.11.004

10. Kirkley A, Griffin S, McLintock H, Ng L. The development and evaluation of a disease-specific quality of life measurement tool for shoulder instability. The Western Ontario Shoulder Instability Index (WOSI). Am J Sports Med. 1998 Dec;26(6):764–772.

11. Kirkley A, Griffin S, Richards C, Miniaci A, Mohtadi N. Prospective randomized clinical trial comparing the effectiveness of immediate arthroscopic stabilization versus immobilization and rehabilitation in first traumatic anterior dislocations of the shoulder. Arthroscopy. 1999 Aug;15(5):507–514.

12. Kirkley A, Werstine R, Ratjek A, Griffin S. Prospective randomized clinical trial comparing the effectiveness of immediate arthroscopic stabilization versus immobilization and rehabilitation in first traumatic anterior dislocations of the shoulder: long-term evaluation. Arthroscopy. 2005 Jan;21(1):55–63. doi:10.1016/j.arthro.2004.09.018

13. Krøner K, Lind T, Jensen J. The epidemiology of shoulder dislocations. Arch Orthop Trauma Surg. 1989;108(5):288–290.

14. Liavaag S, Svenningsen S, Reikerås O, Enger M, Fjalestad T, Pripp AH, et al. The epidemiology of shoulder dislocations in Oslo. Scand J Med Sci Sports. 2011 Dec;21(6):e334-340. doi:10.1111/j.1600-0838.2011.01300.x

15. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JPA, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. BMJ. 2009 Dec 4;339(jul21 1):b2700–b2700. doi:10.1136/bmj.b2700

16. McGuinness LA, Higgins JPT. Risk-of-bias VISualization (robvis): An R package and Shiny web app for visualizing risk-of-bias assessments. Res Syn Meth. 2021 Jan;12(1):55–61. doi:10.1002/jrsm.1411

17. Minkus M, Königshausen M, Maier D, Mauch F, Stein T, Greiner S, et al. Immobilization in External Rotation and Abduction Versus Arthroscopic Stabilization After First-Time Anterior Shoulder Dislocation: A Multicenter Randomized Controlled Trial. Am J Sports Med. 2021 Mar;49(4):857–865. doi:10.1177/0363546520987823

18. Murphy AI, Hurley ET, Hurley DJ, Pauzenberger L, Mullett H. Long-term outcomes of the arthroscopic Bankart repair: a systematic review of studies at 10-year follow-up. J Shoulder Elbow Surg. 2019 Nov;28(11):2084–2089. doi:10.1016/j.jse.2019.04.057

19. Park I, Lee J-H, Hyun H-S, Lee T-K, Shin S-J. Minimal clinically important differences in Rowe and Western Ontario Shoulder Instability Index scores after arthroscopic repair of anterior shoulder instability. J Shoulder Elbow Surg. 2018 Apr;27(4):579–584. doi:10.1016/j.jse.2017.10.032

20. Porcellini G, Campi F, Pegreffi F, Castagna A, Paladini P. Predisposing factors for recurrent shoulder dislocation after arthroscopic treatment. J Bone Joint Surg Am. 2009 Nov;91(11):2537–2542. doi:10.2106/JBJS.H.01126

21. Pougès C, Hardy A, Vervoort T, Amouyel T, Duriez P, Lalanne C, et al. Arthroscopic Bankart Repair Versus Immobilization for First Episode of Anterior Shoulder Dislocation Before the Age of 25: A Randomized Controlled Trial. Am J Sports Med. 2021 Apr;49(5):1166–1174. doi:10.1177/0363546521996381

22. Robinson CM, Howes J, Murdoch H, Will E, Graham C. Functional outcome and risk of recurrent instability after primary traumatic anterior shoulder dislocation in young patients. J Bone Joint Surg Am. 2006 Nov;88(11):2326–2336. doi:10.2106/JBJS.E.01327

23. Robinson CM, Jenkins PJ, White TO, Ker A, Will E. Primary arthroscopic stabilization for a first-time anterior dislocation of the shoulder. A randomized, double-blind trial. J Bone Joint Surg Am. 2008 Apr;90(4):708–721. doi:10.2106/JBJS.G.00679

24. Schünemann H, Brożek J, Guyatt G, Oxman A. GRADE handbook for grading quality of evidence and strength of recommendations [Internet]. The GRADE Working Group; 2013 [cited 2021 Mar 8]. Available from: https://gdt.gradepro.org/app/handbook/handbook.html

25. Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;350:g7647. doi:10.1136/bmj.g7647

26. Shields DW, Jefferies JG, Brooksbank AJ, Millar N, Jenkins PJ. Epidemiology of glenohumeral dislocation and subsequent instability in an urban population. J Shoulder Elbow Surg. 2018 Feb;27(2):189–195. doi:10.1016/j.jse.2017.09.006

27. Sterne JAC, Savović J, Page MJ, Elbers RG, Blencowe NS, Boutron I, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. BMJ. 2019 Aug 28;366:l4898. doi:10.1136/bmj.l4898

28. Warth RJ, Briggs KK, Dornan GJ, Horan MP, Millett PJ. Patient expectations before arthroscopic shoulder surgery: correlation with patients' reasons for seeking treatment. J Shoulder Elbow Surg. 2013 Dec;22(12):1676–1681. doi:10.1016/j.jse.2013.05.003

29. Yapp LZ, Nicholson JA, Robinson CM. Primary Arthroscopic Stabilization for a First-Time Anterior Dislocation of the Shoulder: Long-Term Follow-up of a Randomized, Double-Blinded Trial. J Bone Joint Surg Am. 2020 Mar 18;102(6):460–467. doi:10.2106/JBJS.19.00858

30. Zacchilli MA, Owens BD. Epidemiology of shoulder dislocations presenting to emergency departments in the United States. J Bone Joint Surg Am. 2010 Mar;92(3):542–549. doi:10.2106/JBJS.I.00450

Figure and Table Legends

Figure 1: PRISMA flowchart showing the movement of studies through the review process

Table 1: Detailed Characteristics of Included Studies

Table 2: Main Criteria and Protocols of Included Studies

Figure 2: Graphical summaries showing the risk of bias within and across all included studies

Figure 3: Forest plot showing the pooled analysis comparing the effect of surgery versus conservative treatment on short-term (2-3 years) recurrent instability

Figure 4: Forest plot showing the pooled analysis comparing the effect of surgery versus conservative treatment on long-term (5-12 years) recurrent instability

Figure 5: Forest plot showing the pooled analysis comparing the effect of surgery versus conservative treatment on "return to sport"

Figure 6: Forest plot showing the pooled analysis comparing the effect of surgery versus conservative treatment on subsequent surgery in the short-term (2-3 years) period

Figure 7: Forest plot showing the pooled analysis comparing the effect of surgery versus conservative treatment on subsequent surgery in the long-term (5-12 years) period

Figure 8: Forest plot showing the pooled analysis comparing the effect of surgery versus conservative treatment on short-term (2-3 years) WOSI score

Figure 9: Forest plot showing the pooled analysis comparing the effect of surgery versus conservative treatment on long-term (5-12 years) WOSI score

Figure 10: Forest plot showing the pooled analysis comparing the effect of surgery versus conservative treatment on patient satisfaction

Table 1: Detailed Characteristics of Included Studies

Study	Type	Level of Evidence	Sample Size	Mean Age (yrs)	Follow-up Duration (months)	Number of patients in the surgery group				Number of patients in the conservative group			
						Sex		Total	Mean Age (yrs)	Sex		Total	Mean Age (yrs)
						M	F			M	F		
Kirkley 1999[11]	RCT	II	38	22.4	33.1	16	3	19	22.1	18	1	19	22.7
Bottoni 2002[2]	RCT	I	21	22.4	36.6	9	0	9	21.6	12	0	12	23
Jakobsen 2006[9]	RCT	I	76	21.5	24	30	7	37	23	32	7	39	20
Robinson 2008[23]	RCT	I	84	24.8	24	42*	3*	42	24.3	40*	3*	42	25.3
Minkus 2021[17]	RCT	I	91	26.2	24	48*	4*	44	25.7	55*	5*	47	26.7
Pougès 2021[21]	RCT	I	38	21.8	24	15*	5*	19	22	18*	2*	19	21.5
Long Follow-up Data													
Kirkley 2005[12]	RCT	I	31	22.4	79	13	3	16	22.1	14	1	15	22.7
Jakobsen 2006[9]	RCT	I	75	21.4	120	29	7	36	23	32	7	39	20
Yapp 2020[29]	RCT	I	65	24.2	144	30	3	33	24.7	30	2	32	23.8

Table 2: Main Criteria and Protocols of Included Studies

Study	Inclusion Criteria	Exclusion Criteria	Comparison Groups	Surgical Technique
Kirkley 1999[11]	Age less than 30 and first-time traumatic anterior shoulder dislocation	Associated fractures (Except Hill Sachs or Bankart lesion), history or evidence of multidirectional instability of the opposite shoulder, neurovascular compromise of the affected limb, medical condition making the patient unfit for surgery, and unwillingness to be followed for 5 years.	Shoulder immobilization for 3 weeks followed by rehabilitation versus arthroscopic Bankart repair	Arthroscopic Bankart repair using a trans-glenoid suturing technique
Bottoni 2002[2]	Ages 18 to 26 and first-time traumatic shoulder dislocation	Presence of a tuberosity fracture or other concomitant fracture, neurologic injury, any history of previous shoulder injury, previous subluxation, and dead arm syndrome	Shoulder immobilization for 4 weeks in a sling followed by rehabilitation versus arthroscopic Bankart repair	Arthroscopic Bankart repair using a bioabsorbable tack
Jakobsen 2006[9]	Ages 15 to 39 and first-time anterior shoulder dislocation	Fracture of the greater tubercle or history of previous shoulder problems	Arthroscopic lavage followed by immobilization for 2 days in sling versus diagnostic shoulder arthroscopy with open Bankart repair	Diagnostic arthroscopy followed by open Bankart repair using suture anchors
Robinson 2008[23]	Ages 15 to 35 and first-time traumatic anterior shoulder dislocation	Dislocation not caused by a substantial external force, fracture of greater tuberosity/glenoid rim that is visible in conventional radiography, and patient was seen after more than two weeks of the dislocation	Arthroscopic lavage versus arthroscopic Bankart repair with a post-op rehabilitation protocol of shoulder immobilization for 6 weeks	Arthroscopic Bankart repair using suture anchors
Minkus 2021[17]	Ages 18 to 40 and first-time traumatic anterior shoulder dislocation	Recurrent shoulder instability, posterior and multidirectional shoulder instability, concomitant shoulder pathology (such as cuff tear, bony Bankart lesion, dislocation fracture including greater tuberosity fracture, engaging Hill-Sachs lesion, or nerve lesion), non-compliance with brace	Shoulder immobilization in 60 degrees of external rotation and 30 degrees of abduction for 3 weeks followed by rehabilitation versus arthroscopic Bankart repair	Arthroscopic Bankart repair using suture anchors
Pougès 2021[21]	Ages 18 to 25 and first-time traumatic anterior shoulder dislocation	Non-traumatic cause with hyperlaxity, delay between dislocation and surgery of >15 days, humeral head fracture, Bony bankart lesion >25 % of glenoid surface on imaging, HAGL lesion, pregnancy, breast feeding, non-compliance with follow up protocol	Shoulder immobilization in internal rotation for 3 weeks versus arthroscopic Bankart repair	Arthroscopic Bankart repair using suture anchors
Kirkley 2005[12]	Same as Kirkley 1999	Same as Kirkley 1999	Same as Kirkley 1999	Same as Kirkley 1999
Yapp 2020[29]	Same as Robinson 2008	Same as Robinson 2008 in addition to if patients could not be reached or if they declined to participate	Same as Robinson 2008	Same as Robinson 2008

Table 3: Summary of GRADE findings

Bankart Repair Surgery Compared to Conservative Management for First-Time Shoulder Dislocation

Patient or population: First-Time Shoulder Dislocation **Setting**: Clinical **Intervention**: Bankart Repair Surgery **Comparison**: Conservative Management

Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with Conservative Management	**Risk with Surgery**				
Recurrent instability - Recurrent Instability, Short-Term (2-3 Years)	438 per 1,000	**66 per 1,000** (35 to 118)	**RR 0.15** (0.08 to 0.27)	348 (6 RCTs)	⊕⊕⊕◯ MODERATE [a,b]	Surgery results in a large reduction in recurrent instability at the short-term (2-3 Years).
Recurrent Instability, Long-Term (5-12 Years)	651 per 1,000	**150 per 1,000** (91 to 254)	**RR 0.23** (0.14 to 0.39)	171 (3 RCTs)	⊕⊕⊕⊕ HIGH [a]	Surgery likely reduces recurrent instability at the long-term (5-12 years).
Return to play after injury	734 per 1,000	**866 per 1,000** (668 to 1,000)	**RR 1.18** (0.91 to 1.52)	155 (4 RCTs)	⊕⊕⊕⊕ HIGH	Surgery results in little to no difference in return to play after injury.
Subsequent Stabilization Surgery Short-Term (2-3 Years)	252 per 1,000	**48 per 1,000** (23 to 108)	**RR 0.19** (0.09 to 0.43)	272 (6 RCTs)	⊕⊕⊕⊕ HIGH	Surgery reduces subsequent stabilization surgery at the short-term (2-3 years).
Subsequent Stabilization Surgery Long-Term (5-12 Years)	407 per 1,000	**69 per 1,000** (28 to 159)	**RR 0.17** (0.07 to 0.39)	171 (3 RCTs)	⊕⊕◯◯ LOW [a]	Surgery appears to reduce subsequent stabilization surgery in the long-term (5-12 years).
WOSI Score Short-Term (2-3 Years)		MD **7.23 % higher** (0.53 lower to 13.94 higher)	-	251 (4 RCTs)	⊕⊕⊕⊕ HIGH	Surgery increases WOSI score in the short-term (2-3 years).
WOSI Score Long-Term (6.5-12 Years)		MD **7.03 % higher** (1.51 higher to 12.55 higher)	-	96 (2 RCTs)	⊕⊕⊕⊕ HIGH	Surgery slightly increases WOSI score at the long-term (6.5-12 years).
Patient Satisfaction	514 per 1,000	**899 per 1,000** (719 to 1,000)	**RR 1.75** (1.40 to 2.20)	141 (3 RCTs)	⊕⊕⊕◯ MODERATE [a]	Surgery likely increases patient satisfaction.

***The risk in the intervention group** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: Confidence interval; **RR:** Risk ratio; **MD:** Mean difference

GRADE Working Group grades of evidence
High certainty: We are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect.
Very low certainty: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect.

Explanations
a: Blinding of patients and outcome assessors was not mentioned.
b: Blinding was reported not possible for patients and not feasible for outcome examiners.