



Long-term outcomes of the arthroscopic Bankart repair: a systematic review of studies at 10-year follow-up

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Background: The purpose of this study was to systematically review the evidence in the literature to ascertain the functional outcomes and recurrences rates, as well as subsequent revision rates, following arthroscopic Bankart repair at a minimum of 10 years' follow-up.

Methods: Two independent reviewers performed a literature search based on Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines, using the Embase, MEDLINE, and Cochrane Library databases. Studies were included if they were clinical studies on arthroscopic Bankart repair with a minimum of 10 years' follow-up. Statistical analysis was performed using SPSS software.

Results: Our review found 9 studies including 822 shoulders meeting our inclusion criteria. The majority of patients were male patients (75.5%), the average age was 28.0 years (range, 15-73 years), and the mean follow-up period was 149.4 months. The most commonly used functional outcome score was the Rowe score, with a weighted mean of 87.0. Overall, 77.6% of athletes were able to return to sports post-operatively. The overall rate of recurrent instability was 31.2%, with 16.0% of patients having recurrent dislocations, and the overall revision rate was 17.0%. Evidence of instability arthropathy was found in 59.4% of patients, with 10.5% of patients having moderate to severe arthropathy.

Discussion and conclusion: Arthroscopic Bankart repair for anterior shoulder instability has been shown to result in excellent long-term functional outcomes despite a relatively high rate of recurrent instability necessitating revision surgery. In addition, the high rate of instability arthropathy is a concern following arthroscopic Bankart repair in the long term.

Level of evidence: Level IV; Systematic Review

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Institutional review board approval was not required for this systematic review of the literature.

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Anterior shoulder instability is a common clinical problem among athletic populations, with rates as high as 15% reported in collision athletes.¹⁴ Arthroscopic Bankart repair (ABR) is the most commonly performed surgical procedure for anterior shoulder instability on a global basis,

with the majority of surgeons favoring it as an initial surgical treatment.³ Several systematic reviews and meta-analyses have shown that the use of suture anchors and modern arthroscopic techniques results in similar outcomes to an open Bankart repair.^{6,22}

There are concerns because of the high rates of recurrence of instability with ABR, with rates of up to 40% reported in the literature.²¹ As a result, patients with significant risk factors for recurrence such as glenoid bone loss, collision-sport athletes, and young male patients are often treated with osseous procedures.^{25,29} However, ABR has the advantage of providing a minimally invasive, anatomic reconstruction with low rates of operative complications.² In addition, there are concerns over the high rates of instability arthropathy reported in the long term with ABR.^{13,23}

The long-term outcomes following ABR remain unclear, with the literature consisting of a few case series.^{1,4,5,8,12,13,18,21,23,24,31,32} Therefore, the purpose of this study was to systematically review the evidence in the literature to ascertain the functional outcomes and recurrences rates, as well as subsequent revision rates, following ABR at a minimum of 10 years' follow-up. Our hypothesis was that ABR would result in good long-term outcomes but considerable recurrence and subsequent revision rates.

Methods

Study selection

Two authors completed a literature search using the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines and reviewed the search results, with a third author arbitrating on any potential disagreements.¹⁷ Potentially eligible studies received a full-text review once the title and abstract identified in the search were screened.

Search strategy

No time limit on publication date was applied to the search algorithms using the MEDLINE, Embase, and Cochrane Library databases. The June 2018 search algorithm consisted of the following: (long-term or long term or follow-up or 10 or 20) and (Bankart or Bankart repair or stabilization) and (arthrosc*) and (shoulder or shoulder instability or anterior shoulder instability).

Eligibility criteria

The inclusion criteria were (1) clinical studies on ABR, (2) 10-year follow-up, (3) full text published in a peer-reviewed journal, and (4) publication in English. The exclusion criteria included (1) open Bankart repair, (2) review studies, (3) biomechanical studies, (4) cadaveric studies, and (5) abstract only.

Data extraction and analysis

The relevant information regarding the study characteristics was collected by 2 blinded reviewers using a predetermined data sheet, with the results analyzed and compared by a third independent reviewer. The study characteristics included the study design, level of evidence, methodologic quality of evidence (MQOE), population, clinical outcome measures, and follow-up time points.

The guidelines created by the Oxford Centre for Evidence-Based Medicine aided in the evaluation of the level of evidence, whereas the modified Coleman methodology score was used to evaluate the MQOE.⁷ According to these previous guidelines, studies were considered excellent quality if they scored 85 to 100; good quality, 70 to 84; fair quality, 55 to 69; and poor quality, less than 55. Extracted clinical outcomes analyzed were (1) functional outcomes and return to sports, (2) recurrent instability, (3) revision, (4) instability arthropathy, and (5) residual pain.

Statistics

By use of IBM SPSS Statistics for Macintosh (version 22.0 [2013 release]; IBM, Armonk, NY, USA), a quantitative statistical analysis was performed for pooled analysis.

Results

Literature search

The initial literature search resulted in a total of 2013 studies. After removal of duplicates, the articles were screened for inclusion and exclusion criteria, and 1378 unique studies were evaluated and full texts were assessed for eligibility. Nine clinical studies with 822 shoulders were included in this review (Fig. 1).^{1,4,5,8,12,13,18,21,23,24,31,32}

Study characteristics and patient demographic characteristics

The 9 studies comprised 810 patients and 822 shoulders. There were 2 level III and 7 level IV studies, and the mean MQOE score of the studies was 61.6. Of the included studies, 7 were retrospective and 2 were prospective. The majority of patients were male patients (75.5%), the average age was 28.0 years (range, 15-73 years), and the mean follow-up period was 149.4 months. Study characteristics and patient demographic characteristics are shown in Table I.

Functional outcomes and return to play

The overall rate of return to play was reported in 4 studies, with 219 patients (Table II). The overall rate of return to play was 77.6%. The most commonly used functional outcome score was the Rowe score, with a weighted mean of 87.0 (n = 281) at final follow-up. Overall, 85.6% of patients (220 of 257) were satisfied with the procedure.

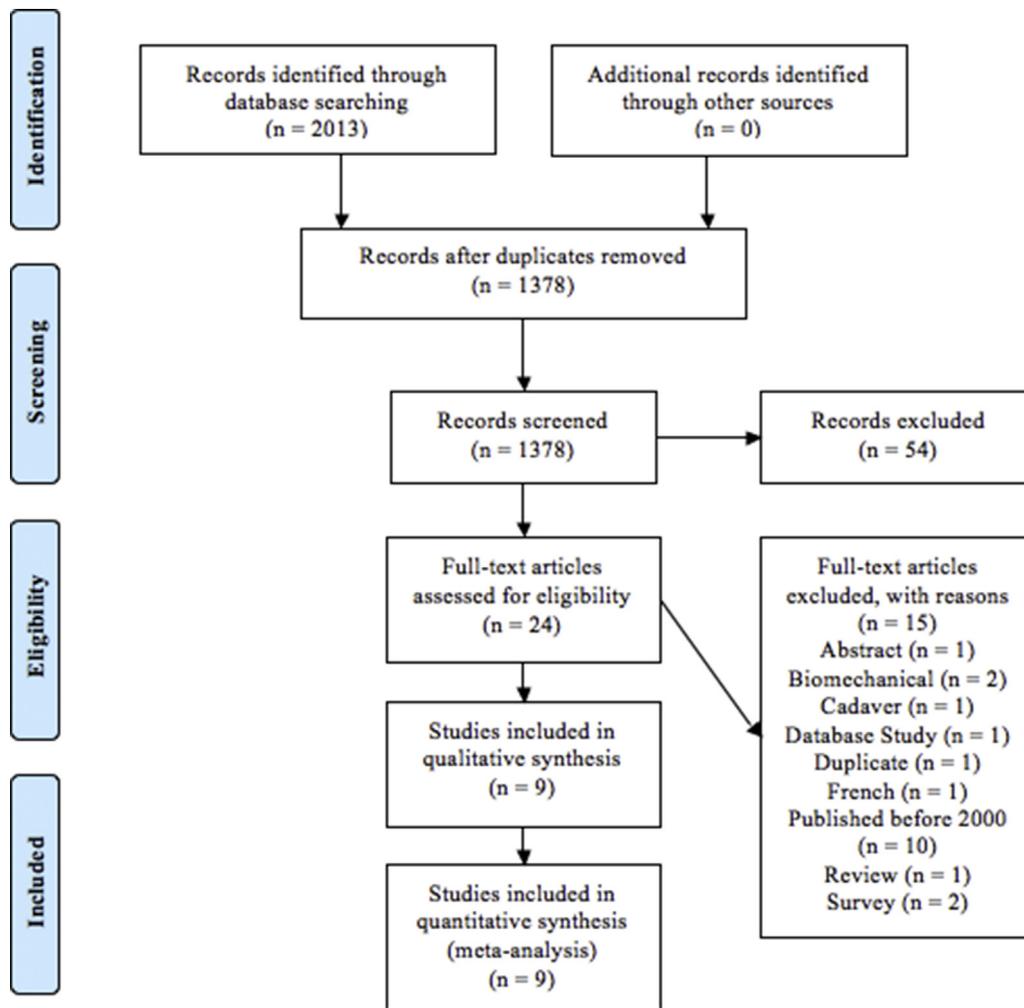


Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) study selection flow diagram.

Recurrent instability and revisions

The overall rate of recurrent instability was reported in 6 studies, with 547 shoulders; there were 171 recurrent instability events (31.2%) (Table III). Seven studies reported the rate of recurrent dislocation, at 16.0% (102 of

637), and 4 studies reported the rate of recurrent subluxation, at 17.1% (62 of 362). The rate of persistent apprehension was reported in 4 studies, with 26.0% of shoulders (102 of 392) having persistent apprehension. The overall revision rate was reported in 6 studies, with 599 shoulders.

Table I Study characteristics and patient demographic characteristics

Authors	Shoulders (patients), n	Prospective or retrospective	LOE	MQOE score	Male patients	Age, yr	Follow-up, mo
Aboalata et al, ¹ 2016	143 (143)	Retrospective	IV	62	107	28 ± 8.3	159.5
Castagna et al, ⁴ 2010	31 (30)	Retrospective	IV	63	26	26.3 ± 7	130.7
Chapus et al, ⁵ 2015	18 (18)	Prospective	IV	48	18	20.5 ± 3.4	116.4
Flinkkilä et al, ⁸ 2018	167 (163)	Retrospective	IV	53	132	26 (15-58)	146.3
Kavaja et al, ¹³ 2012	83 (81)	Retrospective	IV	66	60	29 ± 9	156
Owens et al, ²¹ 2009	40 (39)	Prospective	IV	71	37	20 (17-23)	140.4
Privitera et al, ²⁴ 2012	20 (20)	Retrospective	IV	73	20	43 (28-73)	162
Zaffagnini et al, ³¹ 2012	49 (49)	Retrospective	III	50	NR	35 ± 8	164.4
Zimmermann et al, ³² 2016	271 (267)	Retrospective	III	68	184	28 ± 11.3	146

LOE, level of evidence; MQOE, methodologic quality of evidence; NR, not reported.

Table II Functional outcomes and RTP

Outcome	Studies	Data
Total RTP rate, % (n)	4	77.6 (170 of 219)
Mean Rowe score (n)	5	87 (281)
Mean Constant score (n)	3	76.2 (275)
Satisfaction rate, % (n)	3	85.6 (220 of 257)

RTP, return to play.

Overall, there were 102 revisions (17.0%). In the included studies, no patient underwent revision surgery for a reason other than recurrent instability.

Instability arthropathy

The overall rate of instability arthropathy at final follow-up was reported in 5 studies, with 281 shoulders (Table IV). The overall instability arthropathy rate was 59.4% (167 of 281). At final follow-up, grade I arthritic changes were noted in 35.4% (64 of 181); grade II changes, 8.8% (64 of 181); and grade III changes, 1.7% (3 of 181). No patient in the included studies underwent shoulder arthroplasty owing to instability arthropathy during the reported follow-up.

Discussion

The most important finding of this study was that excellent functional outcomes were reported following ABR. The relatively high rate of recurrent instability necessitating revision surgery and the high rate of instability arthropathy are a cause for concern in the long term. However, despite this, the vast majority of patients reported long-term satisfaction with the procedure.

The high rate of recurrent instability in the long term following ABR is concerning, as almost a third of patients reported a recurrent instability event. In their study, Zimmerman et al³² found that shoulder stability declined steadily over time until 10 years and then remained stable over time. In a recent systematic review, Hurley et al¹¹ found that the rate of postoperative recurrence was 8.5% following the Latarjet procedure in studies with greater than 10 years' follow-up. Despite the higher rate of recurrence, owing to the complications associated with the Latarjet procedure, including hardware failure, graft

Table III Recurrent instability and revisions

Outcome	Studies	% (n)
Revision due to recurrence	6	17.0 (102 of 599)
Total recurrences	6	31.2 (171 of 547)
Re-dislocation	7	16.0 (102 of 637)
Subluxation	4	17.1 (62 of 362)
Apprehension	4	26.0 (102 of 392)

Table IV Instability arthropathy

Grade at final follow-up	Studies	% (n)
Any	5	59.4 (267 of 281)
I	4	35.4 (64 of 181)
II	4	8.8 (16 of 181)
III	4	1.7 (3 of 181)

failure, and neurovascular injuries, ABR has been suggested to be the more cost-effective procedure in a cost-effectiveness analysis by Min et al.²⁰ However, they emphasized that the decision on the procedure should be made on a case-by-case basis because in patients with significant risk factors for recurrence, the Latarjet procedure was more likely to be the more cost-effective treatment ultimately.

In recent years, further research on the risk factors for postoperative recurrence has led to the introduction of tools such as the Instability Severity Index Score that are supposed to appropriately identify which patients are candidates for ABR or the Latarjet procedure.²⁹ Appropriate identification of patients for whom ABR is suitable may have the potential to significantly reduce the postoperative recurrence rate. Randelli et al²⁷ identified age younger than 22 years, male sex, number of preoperative dislocations, and participation in competitive sports as risk factors for recurrence. In addition, multiple studies have identified glenohumeral bone loss as a risk factor for recurrence, with authors advocating the Latarjet procedure or other osseous glenoid reconstruction procedures in patients with significant glenoid bone loss and additional remplissage in patients with large Hill-Sachs lesions.^{25,29} However, Leroux et al¹⁶ highlighted the importance of adequate patient selection by showing that recurrence rates could be reduced by half in collision athletes by limiting ABR to patients with minimal glenoid bone loss.

All revision surgical procedures in our review were performed for recurrent instability. The rate of revision surgery is still concerning with over a sixth of patients requiring a revision procedure in the long term. Aboalata et al¹ found that in a group of patients undergoing revision ABR, 12.7% had further recurrence. In this cohort of patients, the Latarjet procedure is often indicated, with several studies showing lower levels of recurrence following the Latarjet procedure as a revision stabilization.^{9,10,26}

Although complications such as stiffness may be a concern in the long term after ABR, stiffness was not reported in any of the included studies in the long term. Similarly, although our study did not focus on short-term complications, wound infection and neurovascular damage were not reported in any studies, and no neurologic injury was reported to be a problem in the long term.

Despite the high rates of revision and recurrence, the overall rate of patient satisfaction was high in the included studies. This is reflected by the high scores in functional outcome scoring systems and indicates that the shoulder seems not to be a limiting factor in day-to-day activity. A variety of reported functional outcome scores were used in the studies, with the Rowe score being the most commonly used. These studies all reported a mean Rowe score greater than 80, indicating a good result. Warth et al³⁰ found return to play to be the most important factor for patient satisfaction in patients undergoing shoulder stabilization. With our study focusing on long-term outcomes, this is, however, unlikely to be as large a contributory factor to patient satisfaction as overall functional ability. Similar rates of long-term satisfaction have been reported after the Latarjet procedure.¹¹

Recurrent shoulder instability is a significant risk factor for the development and progression of glenohumeral arthropathy. Marx et al¹⁹ found that the risk of severe arthrosis may be up to 10 to 20 times greater among patients who have previously dislocated their shoulders compared with those who have not. The literature showed that there was a high rate of instability arthropathy in the long term following ABR. Our review established that the overall rate of patients showing radiologic signs of instability arthropathy was approximately 60%, despite the majority of patients having clinically stable shoulders at final follow-up. These findings support the theory that instability arthropathy has its origin in the primary trauma with initially undetectable damage to the cartilage and subchondral bone that progresses over time. These instability events often cause Hill-Sachs lesions of varying severity, with damage to the articular cartilage of the humeral head, and this may also play a role in the development of dislocation arthropathy. In addition, there may be a component of microinstability postoperatively that plays a role in the development and progression of instability arthropathy despite a clinically stable shoulder.¹⁵ Specifically, the high rate of instability arthropathy is concerning in light of a recent systematic review by Hurley et al¹¹ that found a 38.1% rate of instability arthropathy following the Latarjet procedure after 10 years' follow-up, which is considerably lower than the rate found in our study. However, in the vast majority of cases, the instability arthropathy was mild, with very few patients experiencing severe changes and no patients requiring an arthroplasty.

Plath et al²³ described multiple potential risk factors for the development of instability arthropathy including age at primary dislocation and at surgery, number of preoperative dislocations, time from initial dislocation to surgery, number and type of fixation devices used during surgery, recurrence of instability, and external rotation deficit at the time of follow-up. In addition, Aboalata et al¹ found that the severity of osteoarthritis was substantially correlated to the number of preoperative dislocations, age of the patient at the time of the initial instability episode and surgery, and

number of anchors used. However, Rhee et al²⁸ did not find a direct relationship between arthropathy and misplaced sutures. Further focus and study on the patients who are most at risk of progressive arthropathy and development of strategies to reduce this risk are still needed to improve the long-term outcome of shoulder stabilization surgery and halt progression of instability arthropathy.

Limitations

The limitations of this systematic review were directly related to the limitations of the included studies. There are several limitations inherent to systematic reviews, including publication bias, search bias, selection bias, and heterogeneity of results. Selection bias may have been introduced due to the fact that all but 2 of the included studies were retrospective and only 2 studies were controlled. Surgical techniques for ABR varied among included studies, which could potentially influence outcomes. Furthermore, contemporary arthroscopic stabilization techniques have been shown to provide reduced recurrent instability rates in short-term follow-up studies, rendering the results of this review potentially not fully representative of modern surgical techniques.

Conclusion

ABR for anterior shoulder instability has been shown to result in excellent long-term functional outcomes despite a relatively high rate of recurrent instability necessitating revision surgery. In addition, a high rate of instability arthropathy is a concern following ABR in the long term.

Disclaimer

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