

Arthroscopic Bankart Repair Versus Open Latarjet for Recurrent Shoulder Instability in Athletes

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Background: In athletes with recurrent shoulder instability, arthroscopic Bankart repair (ABR) and the open Latarjet procedure (OL) are commonly indicated to restore stability and allow them to return to play (RTP).

Purpose: To compare the outcomes of ABR and OL in athletes with recurrent shoulder instability.

Study Design: Cohort study; Level of evidence, 3.

Methods: We performed a retrospective review of patients with recurrent shoulder instability who underwent ABR and OL and had a minimum 24-month follow-up. Indications for OL over ABR in this population were those considered at high risk for recurrence, including patients with glenohumeral bone loss. The patients were pair-matched in a 1:1 ratio (OL and ABR) by age, sex, sport, and level of preoperative play. We evaluated the rate, level, and timing of RTP, and the Shoulder Instability–Return to Sport after Injury (SIRSI) score between procedures. Additionally we compared the recurrence rate, visual analog scale (VAS) pain score, Subjective Shoulder Value (SSV), Rowe score, satisfaction, and whether patients would undergo the same surgery again.

Results: Participants included 62 athletes who underwent ABR and 62 who underwent OL, with a mean follow-up of 47.7 months. There was no significant difference between ABR and OL in rate of RTP, return to preinjury level, time to return, SIRSI score, VAS score, SSV, or patient satisfaction. OL resulted in a significantly lower recurrence rate (1.6% vs 16.1% for ABR; $P = .009$) and a significantly higher Rowe score (mean \pm SD, 90.5 ± 12.2 vs 82.2 ± 20.8 for ABR; $P = .008$). In collision athletes, there was no significant difference between ABR and OL regarding RTP rate (89.1% vs 94.5%; $P = .489$) or SIRSI score (70.4 ± 24.8 vs 73.8 ± 19.6 ; $P = .426$), but OL resulted in a lower recurrence rate (14.5% vs 1.8%; $P = .031$).

Conclusion: ABR and OL resulted in excellent clinical outcomes, with high rates of RTP in athletes. However, lower recurrence rates were seen with OL.

Keywords: shoulder; instability; Bankart repair; Latarjet; athlete; return to play

Anterior shoulder instability is commonly seen in 1% to 2% of the general population,^{20,45} with rates of 15% reported in collision athletes.^{26,33} Additionally, rates of dislocations

have been found to be between 8 and 17 dislocations per 100,000 person-years.^{28,35,40} Athletes with anterior shoulder instability are primarily concerned with their ability to return to play (RTP), which has been shown to affect decision-making about treatment more so than other factors, such as shoulder stability.⁴⁴

It has been established that nonoperative management for shoulder instability results in lower rates of RTP, with higher rates of recurrent instability than operative management.²² Therefore, surgery may be indicated in this population for athletes to successfully RTP. In athletes with recurrent shoulder instability, the arthroscopic Bankart repair (ABR) and the open Latarjet procedure (OL) are the most commonly utilized procedures to restore stability and allow for RTP.^{9,24,31} However, it is still unclear how ABR and OL compare in athletic populations with recurrent instability and whether there is a difference in the rate

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Ethical approval for this study was obtained from the Sports Surgery Clinic (SAREB02/12/18HM/NF).

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or timing of RTP. Furthermore, it is unclear how ABR and OL differ in functional outcomes in athletes. However, it has been established that OL results in lower rates of postoperative recurrence in this population.^{2,17}

The purpose of this study was to compare the outcomes of ABR and OL in athletes with recurrent shoulder instability. In a companion study, these outcomes were evaluated in athletes with first-time dislocation.¹⁸ Our hypothesis was that athletes undergoing OL for recurrent instability would have a similar rate of RTP and time to RTP when compared with ABR but a lower rate of subsequent recurrent instability.

METHODS

Patient Selection

This study received ethical approval from our institutional review board. A retrospective review was carried out to identify all patients who underwent ABR or OL by a single surgeon (H.M.) between July 2012 and March 2018. We analyzed the operative notes of all patients who underwent ABR or OL, including those playing sports preoperatively. The indications for OL over ABR in this population were those considered at high risk for recurrence, including those with glenohumeral bone loss, and the final decision for which procedure to perform was made in consideration of these risk factors and patient preference. The inclusion criteria for this study were recurrent anterior shoulder dislocation (ie, ≥ 2 dislocations) and preoperative sport playing. The exclusion criteria were first-time shoulder dislocation, previous shoulder surgery, and nonathletes. Patient matching between ABR and OL based on patient characteristics (age, sex, sport, level of preoperative play, and follow-up length) was performed to generate 2 comparable groups.

Imaging

All patients had a preoperative magnetic resonance imaging scan as part of diagnosis and operative planning. Images were used to calculate glenoid bone loss using the best-fit circle method.¹⁶

Surgical Technique

Both surgical procedures were performed in the beach-chair position under general anesthesia. An examination under anesthesia was performed perioperatively on both shoulders to evaluate instability, range of motion, and joint laxity. Arthroscopic examination was performed through a standard posterior portal, including evaluation of the capsuloligamentous complex, while the glenoid and humerus were checked for osteochondral or osseous defects, including the presence of off-track Hill-Sachs lesions. A dynamic examination was performed to evaluate instability, laxity, and engagement of any osseous defects while moving the shoulder through its full range of motion. A probe was then used to assess the stability of the labrum and biceps anchor.

In the case of an ABR, the labrum was then mobilized and the glenoid bone freshened. The capsulolabral tissues were

fixed to the glenoid rim with single-loaded suture anchors approximately up to the 11- or 1-o'clock position. A minimum of 3 suture anchors in a single-row configuration were used in all cases. All arthroscopic knots were positioned away from the joint to avoid glenohumeral irritation.

In the case of an OL, after arthroscopic examination, a 4 cm-long skin incision was placed in extension of the axillary fold, starting approximately 2 to 3 finger breadths distal to the tip of the coracoid. A horizontal subscapularis split was performed at the junction between its middle and lower third to expose the capsule. The coracoid graft was fixed to the glenoid with 2 standard 3.5-mm partially threaded cancellous screws. The graft was then contoured to be flush with the glenoid surface using a high-speed bur. Capsular closure was then performed with 2 to 3 nonabsorbable stitches.

Rehabilitation Protocol

The rehabilitation protocol was the same for all patients. Postoperatively, the shoulder was placed in a sling for 3 weeks, allowing nonresisted activities of daily living without excessive elevation or external rotation of the shoulder. Patients immediately began physical therapy, which increased in intensity over the next 9 weeks. Return to contact in training was allowed after 12 weeks, while return to full contact and competition usually would follow within the next 3 months. In clearing an athlete to RTP, strength, range of motion, and pain were considered alongside time. Additionally, in the case of OL, healing was evaluated via radiograph at 12 weeks postoperatively.

Clinical Outcomes

Participants provided postoperative patient-reported outcomes via telephone survey. The rate, level, and timing of RTP, and the Shoulder Instability–Return to Sport after Injury (SIRSI) score were evaluated; a SIRSI of >56 is considered a passing score for being psychologically ready to RTP.¹⁴ Apprehension was assessed by asking if patients had subjective instability at extreme range of motion. Additionally, patients were asked for recurrence data, visual analog scale (VAS) pain score, Subjective Shoulder Value (SSV), Rowe score, satisfaction, and whether they would undergo the same surgery again. Furthermore, sport-specific outcomes were analyzed in collision athletes.

Statistical Analysis

Statistical analysis was carried out using SPSS Version 22 (IBM Corp). A power calculation was performed for the rate and timing of RTP and for SIRSI score, with an alpha of 0.05 and a power of 0.8; it revealed that 78 patients were required for the study to be adequately powered. For all continuous and categorical variables, descriptive statistics were calculated. Continuous variables were reported as weighted mean and estimated standard deviation, whereas categorical variables were reported as frequencies with percentages. Categorical variables were analyzed using a Fisher exact test or chi-square test. The independent or

TABLE 1
Patient Characteristics Between Study Groups^a

	ABR (n = 62)	OL (n = 62)	P Value
Age, y	22.1 ± 4.2	22.1 ± 4.9	≥.999
Male sex	62 (100)	62 (100)	≥.999
Collision sport	55 (88.7)	55 (88.7)	≥.999
Percentage glenoid bone loss	1.9 ± 4	11.8 ± 8.2	<.001
Off-track Hill-Sachs lesion, %	9.7	45.2	<.001

^aData are reported as mean ± SD or No. (%) unless otherwise indicated. Bold P values indicate statistically significant difference between groups (P < .05). ABR, arthroscopic Bankart repair; OL, open Latarjet procedure.

TABLE 2
Return to Play^a

	ABR	OL	P Value
Return to play	53 (88.3)	58 (93.5)	.154
Same/higher level	47 (75.8)	50 (80.6)	.664
Timing, mo	5.6 ± 2.2	5.5 ± 2.7	.822
SIRSI			
Score	70.1 ± 20.6	74.8 ± 19.5	.195
Pass	47 (75.8)	50 (80.6)	.664

^aData are reported as mean ± SD or No. (%). ABR, arthroscopic Bankart repair; OL, open Latarjet procedure; SIRSI, Shoulder Instability-Return to Sport after Injury.

paired *t* test was performed to compare normally distributed variables, and the nonparametric Mann-Whitney *U* test or Wilcoxon signed-rank test was used for continuous variables. *P* < .05 was considered to be statistically significant.

RESULTS

Patient Characteristics

Overall, 487 ABRs and 297 OLs were performed in our institution during this period. After analysis, 62 athletes treated with ABR were matched with 62 treated with OL, with a mean follow-up of 47.7 months (range, 24-84 months). Collision athletes accounted for 89% of both groups and were composed of predominantly rugby union and Gaelic football athletes. The 2 groups were perfectly matched for the same number of athletes from each sport and sex. There were no significant differences in characteristic variables between the groups, except for glenoid bone loss and off-track Hill-Sachs lesions, which were higher in those treated with OL. A comparison of patient characteristics between the OL and ABR groups is shown in Table 1.

Return to Play

There was no significant difference between the mean time of RTP in the ABR group and the OL group (5.6 ± 2.2 vs 5.5 ± 2.7 months; *P* = .822). Similarly, there was no significant

TABLE 3
Patient-Reported Outcomes^a

	ABR	OL	P Value
VAS pain score	1.4 ± 1.6	1.8 ± 1.8	.193
Subjective Shoulder Value	83.8 ± 21.7	87.6 ± 13.2	.241
Rowe score	82.2 ± 20.8	90.5 ± 12.2	.008
Satisfied	53 (85.5)	56 (90.3)	.583
Would undergo surgery again	58 (93.5)	59 (95.2)	.697

^aData are reported as mean ± SD or No. (%). Bolded P value indicates statistically significant difference between groups (P < .05). ABR, arthroscopic Bankart repair; OL, open Latarjet procedure; SIRSI, Shoulder Instability-Return to Sport after Injury; VAS, visual analog scale.

TABLE 4
Recurrent Instability^a

	ABR	OL	P Value
Total recurrence	10 (16.1)	1 (1.6)	.009
Redislocation	8 (12.9)	1 (1.6)	.032
Subluxation	2 (3.2)	0 (0)	.496
Apprehension	16 (25.8)	11 (20)	.384

^aData are reported as No. (%). Bold P values indicate statistically significant difference between groups (P < .05). ABR, arthroscopic Bankart repair; OL, open Latarjet procedure.

difference in the rate of RTP, return at the same/higher level, SIRSI score, or passing SIRSI score. A comparison of RTP between the ABR and OL groups is illustrated in Table 2. For patients in the ABR group who did not RTP, the reasons for not returning included shoulder injury in 4 (44%) and lifestyle reasons in 5 (55%). Of the patients who underwent OL and did not RTP, the reasons for not returning included shoulder injury in 3 (75%) and lifestyle reasons in 1 (25%).

Patient-Reported Outcomes

At final follow-up, there was no significant difference between the groups in VAS pain, SSV, patient satisfaction, or whether patients would undergo surgery again. The OL group had a significantly higher Rowe score (90.5 ± 12.2 vs 82.2 ± 20.8 for ABR; *P* = .008). A comparison of patient-reported outcomes between the ABR and OL groups is presented in Table 3.

Recurrent Instability

Overall, 10 (16.1%) patients in the ABR group and 1 (1.6%) in the OL group experienced recurrent instability (*P* = .009), with a significant difference in redislocation rate (12.9% vs 1.6%; *P* = .032). Time to redislocation was not consistently documented. There were no intraoperative complications in our series. However, in those undergoing OL, 2 patients required a wash-out for hematoma during their admission, and 1 had a superficial wound infection that resolved with antibiotics. The OL group had no nonunions or hardware failure. Recurrence between the ABR and OL groups is compared in Table 4.

TABLE 5
Outcomes in Collision Athletes^a

	ABR (n = 55)	OL (n = 55)	P Value
Return to play	49 (89.1)	52 (94.5)	.489
Same/higher level	46 (83.6)	44 (80)	.805
Timing, mo	5.8 ± 2.2	5.5 ± 2.7	.524
SIRSI			
Score	70.4 ± 24.8	73.8 ± 19.6	.426
Pass	44 (80)	44 (80)	≥.999
Recurrence	8 (14.5)	1 (1.8)	.031
Redislocation	7 (12.7)	1 (1.8)	.060

^aData are reported as No. (%) or mean ± SD. Bold *P* value indicates statistically significant difference between groups (*P* < .05). ABR, arthroscopic Bankart repair; OL, open Latarjet procedure; SIRSI, Shoulder Instability-Return to Sport after Injury.

Outcomes in Collision Athletes

There was no significant difference in the mean time of RTP between collision athletes in the ABR group and those in the OL group (5.8 ± 2.2 vs 5.5 ± 2.7 months; *P* = .524). Similarly, there was no significant difference in the rate of RTP or return at the same/higher level or in SIRSI score or passing SIRSI score. However, there was a significant difference in the rate of recurrent instability (14.5% [ABR] vs 1.8% [OL]; *P* = .031). A comparison of outcomes in collision athletes between the ABR and OL groups is shown in Table 5.

DISCUSSION

The most important finding from this study was that both ABR and OL resulted in high rates of RTP, with a similar time to RTP and similar SIRSI scores. However, OL resulted in a significantly lower rate of recurrent instability. There was no difference in any clinical outcome measure between the procedures in athletes, with excellent clinical outcomes reported. Additionally, there was a significantly lower rate of recurrent instability in collision athletes treated with an OL, but no difference in RTP, time to RTP, or SIRSI scores in this population.

ABR is the most commonly performed procedure for shoulder instability globally.¹³ Murphy et al³³ reported satisfactory functional results at 10-year follow-up; however, the rate of recurrence was up to 30% to 40%. The OL is a more invasive treatment option, favored primarily in Europe, and it involves transferring part of the coracoid process and the conjoint tendon to the anterior aspect of the glenoid rim to restore stability. The OL is typically indicated over ABR in those with recurrent instability with higher volumes of glenoid bone loss, as it results in lower recurrence rates; however, there is a concern with this procedure because of its associated complications.^{2,10,15,19,25} While traditionally performed in open fashion, the Latarjet procedure is increasingly being performed arthroscopically, with limited albeit promising evidence.^{7,11,20,29,36}

The athletes' primary concern when undergoing shoulder stabilization is their ability to RTP, with surgical

intervention responsible for higher rates of RTP than non-operative management.^{22,44} Our findings coincide with RTP rates in the literature, as systematic reviews by Memon et al³¹ and Hurley et al²⁴ found that 88% and 85% of patients were able to RTP after ABR and OL, respectively. However, when pooled, patients who underwent an OL as opposed to ABR returned at a slightly higher rate (83.5% vs 70.3%).^{5,6,38} Similarly, we demonstrated no difference in time of RTP. The literature suggests that OL results in a faster RTP, potentially explained by the shorter time taken for bone healing versus soft tissue healing. The systematic reviews by Hurley et al and Memon et al reported that RTP after OL and ABR took approximately 5 and 8 months, respectively.

Our study assessed athletes for their psychological readiness to return to sport by employing the SIRSI, and results demonstrated no significant difference between procedures for overall score or pass rate. This suggests that both surgical procedures effectively restore patients' confidence in their shoulder function after operative intervention. The SIRSI was adapted from the Anterior Cruciate Ligament-Return to Sport after Injury (ACL-RSI), in which several studies indicated a higher score in those who achieved full RTP.^{1,3,27,32} Psychological recovery has shown to be an independent factor of a patient's physical recovery, as the ACL-RSI score does not correlate with an athlete's strength and power measures.³⁴ However, a higher ACL-RSI score may be predictive of further injury.³⁰ Additionally, no differences were seen between the cohorts with respect to any patient-reported outcomes, including pain. Pain warrants serious consideration in clearing RTP in these athletes, as it could hinder not only their ability to RTP but also their level of RTP, particularly among collision athletes whose performance may be limited.²³

Collision athletes returned to play at a high rate. Studies have reported outcomes of OL in collision athletes and found that they returned to sport at a high rate with low recurrence.²⁴ Although some studies have shown collision athletes returning at a high rate after ABR, concern over the high rate of recurrent instability in this cohort has been incorporated as part of the Instability Severity Index Score in determining which procedure to perform.^{31,41} However, both procedures resulted in a low recurrence rate in collision athletes, signifying the importance of appropriate patient selection and counseling. Our study revealed similarly high rates of RTP, a similar time to RTP, and similar SIRSI scores regardless of procedure modality in this population, suggesting that both may be efficient in allowing collision athletes to RTP.

Complications were identified in 3 incidences in those undergoing OL, with 2 requiring a washout. However, in a recent randomized controlled trial, Hurley et al²¹ found that the rate of hematoma formation may be reduced with tranexamic acid in those undergoing OL; thus, we have begun to utilize this in our practice. The patient who had a superficial complication was treated with antibiotics, which resolved without issue. No cases of nonunion were identified in the study. All 3 patients who had a complication had no issues at follow-up, were satisfied, would undergo the procedure again, and noted no pain.

Limitations

Glenoid bone loss^{4,8,37,46} as well as off-track Hill-Sachs lesions^{4,12,39,42,43} are considered the biggest risk factors for recurrent instability, and these are the key determining factors in the decision to utilize ABR or OL. Although the ABR and OL groups in this study were matched for preoperative characteristics, we did not control for bone loss, as this differed owing to our clinical indications for either procedure and subsequent patient selection. Thus, despite the greater bone loss in those treated with OL, there still was a significantly lower recurrence rate. Therefore, our findings indicate that even in a higher-risk population, OL results in a lower recurrence rate. As the design of this study was retrospective, it has numerous limitations inherent to this study type. Our study included 2 matched groups; although matching was done as closely as possible, discrepancies will inherently exist. While all patients were matched for sex, sport, and level of sport, there was a slight albeit nonstatistically significant difference in age, but this was also matched as closely as possible. Additionally, the study was not sufficiently powered to assess recurrence rate. Our study design involved postoperative telephone surveys; therefore, physical examination or repeat imaging was not available beyond the routine 12-week postoperative radiograph for OL. Physical examination would have been better to detect subtle motion loss or apprehension, which patients might not self-report. Furthermore, this study reported the findings of a single-surgeon cohort, which may limit generalizability.

CONCLUSION

In the current study, ABR and OL resulted in excellent clinical outcomes, with high rates of RTP in athletes. However, OL resulted in lower recurrence rates.

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