Return to Sport After Coracoid Transfer in Athletes With Anterior Shoulder Instability: A Systematic Review

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Context: Recurrent shoulder instability in young athletes can lead to a spectrum of soft tissue and bony lesions that can be bothersome and/or disabling. Coracoid transfer is a treatment option for athletes with recurrent instability.

Objective: To report the rate of return to sport for athletes after coracoid transfer.

Data Sources: An electronic search of the literature was performed using the PubMed (MEDLINE) and Cochrane Databases (1966-2018).

Study Selection: Studies were included if they evaluated return to sport after treatment with coracoid transfer at a minimum 1-year follow-up.

Study Design: Systematic review.

Level of Evidence: Level 4.

Data Extraction: Data were extracted by 2 authors and included study design, level of evidence, patient demographics (number, age, sex), procedure performed, duration of clinical follow-up, rate of return to sport, patient-reported outcome measures, reoperations, and complications.

Results: Fourteen studies met the inclusion criteria. The rate of return to sport at any level ranged from 80% to 100% in all but 1 study (38%), and the rate of return to the previous level of play ranged from 56% to 95% in all but 1 study (16%). Patients returned to sport at an average of 3.2 to 8.1 months. The average patient-reported outcome scores ranged from 78% to 94% (Rowe), 223.6 to 534.3 (Western Ontario Shoulder Instability Index), and 75% to 90% (subjective shoulder value). The rate of postoperative dislocation ranged from 0% to 14%, and the reoperation rate ranged from 1.4% to 13%.

Conclusion: There was a high early rate of return to sport in patients who underwent coracoid transfer for anterior shoulder instability, although patients did not reliably return to the same level of play. The procedure had very favorable outcomes for treatment of instability, with low rates of recurrent dislocation and reoperation.

Keywords: shoulder instability; coracoid transfer; return to sport

Anterior shoulder instability often occurs in young athletes. These individuals are at a greater risk of shoulder dislocation than the general population,¹⁵ and recurrent dislocations are common. After first-time dislocation, male athletes younger than 25 years have a 75% chance of developing recurrent instability within 2 years.¹⁹ Recurrent instability can lead to a spectrum of soft tissue and bony lesions that can be bothersome or disabling for an athlete. Coracoid

transfer is often recommended for those with instability accompanied by bone loss or hyperlaxity because these factors portend a higher risk of recurrence after arthroscopic Bankart repair.¹

Coracoid transfer is performed by transferring the coracoid process to the anteroinferior glenoid; this restores glenoid concavity and blocks anterior translation of the humeral head while the conjoint tendon acts as a dynamic sling.¹³ Several

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studies have investigated return-to-sport rates after coracoid transfer,²⁻⁷ and several of the largest series have been published recently. An updated review of return-to-sport rates after coracoid transfer is warranted. The purpose of this systematic review is to synthesize the current evidence regarding return-to-sport rates in athletes with shoulder instability after coracoid transfer. Our hypothesis is that patients will have a relatively high rate of return to sport after coracoid transfer.

METHODS

Study Design and Literature Search

A systematic review of the literature following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines was conducted for athletes undergoing coracoid transfer for recurrent anterior shoulder instability. An electronic search of the literature was performed using the PubMed (MEDLINE) and Cochrane Databases. The following search term was used: (return to sport OR return to play OR return to activity OR sports re-entry) AND (latarjet OR bristow-latarjet OR coracoid transfer). The final search was performed on April 15, 2018. The reference section of each full-text article obtained was reviewed for additional inclusions to the study not identified in the electronic search.

Studies were included if they were reported in English and evaluated return to sport after treatment of shoulder instability in patients who underwent coracoid transfer at a minimum 1-year follow-up. Literature reviews, expert opinions, case reports, and studies that did not report on rates of return to sport were all excluded. The initial search revealed 51 unique abstracts, of which 25 relevant full-text articles were assessed for eligibility. Of the 25 full-text articles, 11 were excluded because return to sport was not reported or they were review articles. Therefore, 14 studies were included in the final analysis (Figure 1). The selected abstracts were reviewed by 2 authors. Questions regarding inclusion or exclusion were resolved by discussion with the senior author until consensus was reached.

Data Extraction and Analysis

The following data were extracted from each article: study design, level of evidence, patient demographics (number, age, sex), procedure performed, duration of clinical follow-up, rate of return to sport, patient-reported outcome measures (Rowe score, Western Ontario Shoulder Instability Index [WOSI], subjective shoulder value [SSV]), reoperations, and complications. The primary outcome measure was whether the study participant was able to return to sport after coracoid transfer. Secondary outcomes were Rowe (0 [worst], 100 [best]), WOSI (0 [best], 2100 [worst]), and SSV scores (0 [worst], 100 [best]), rates of postoperative dislocation, and reoperation rate. A majority of the studies did not compare pre- and postoperative scores, and thus, preoperative scores were not included in the analysis.

Study bias was assessed using the Methodological Index for Non-Randomized Studies (MINORS) scoring system, which ranges from 0% (worst) to 100% (best). An assessment of statistical

heterogeneity for return-to-sport rates was performed using MedCalc (MedCalc Software), revealing an I^2 index value greater than 90%. Because of the significant heterogeneity, methodological variability, low levels of evidence, and retrospective nature of the included studies, the pooling of results for meta-analysis was not performed. Instead, a descriptive analysis was performed, and outcomes that were reported in at least 3 studies were summarized using forest plots or tables with ranges, standard deviations, and weighted averages when possible. Descriptive statistics of the outcome measures were presented in the same way that they were reported in the original articles.

RESULTS

The 14 studies analyzed in the systematic review included 883 patients.^{2-8,10,11,14,16-18,21} The studies were primarily level 3 ($n = 4$) or level 4 ($n = 10$) evidence; of the 14 studies, 13 had a MINORS score greater than 80%. Of the studies that reported the participants' sex, the majority were male (88%). The mean age at time of surgery ranged from 18.9 to 37.2 years. Mean length of follow-up varied from 18 to 144 months. A majority of the patients underwent an open Latarjet procedure (Table 1 and Table A1 in the Appendix, available in the online version of this article).

The reporting of return to sport was variable. Ten studies^{2-5,8,11,14,17,18,21} reported return to sport at any level (Table 2 and Appendix Figure A1, available online), which ranged from 80% to 100% with the exception of 1 study (38%).⁸ Eleven studies^{2,3,6,7,10,11,14,16-18,21} reported return to sport at the previous level of play (Table 2 and Appendix Figure A2, available online), which ranged from 56% to 95% with the exception of 1 study (16%). The average time for return to sport ranged from 3.2 to 8.1 months. Change in sporting activity was reported in 5 studies,^{2,11,17,18,21} with a range of 4.6% to 32.1%.

Outcome scores were reported in 12 studies,^{2-6,8,10,11,14,17,18,21} with the Rowe score being most commonly utilized. Eight studies^{3,6,10,11,14,17,18,21} reported Rowe scores, with an average score that ranged from 78% to 94% (Appendix Table A2, available online). Four studies^{2,5,8,10} included WOSI scores, with an average that ranged from 223.6 to 534.3. SSV scores were reported in 4 studies,^{3,4,8,14} with an average that ranged from 75 to 90.

Recurrent instability, as measured by number of postoperative dislocations, was reported in 12 studies^{3-8,11,14,16-18,21} that included 683 patients. Within those studies, there was a total of 20 dislocations, and the recurrent dislocation rate ranged from 0% to 13.8%. Reoperation rate ranged from 1.4% to 13%. Reoperations were performed for recurrent instability, reinjury, infection, irritation from hardware, hematoma evacuation, and nerve injury (Table 3).

DISCUSSION

In athletes with shoulder instability, continued participation in sports is a top priority.²⁰ In recent studies, coracoid transfer has proven to be preferable to arthroscopic Bankart repair in certain subsets of the athletic population.^{1,3,4} Several factors are

Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flowchart demonstrating study selection process.

associated with the risk of recurrent instability after Bankart repair, such as young age, participation in competitive or contact sports, and shoulder hyperlaxity.¹ In addition to demonstrating lower rates of recurrent instability, there is a higher rate of return to the same level of sport in patients who underwent the Latarjet procedure than in patients who underwent arthroscopic Bankart repair.³ Two cohorts of patients were retrospectively compared, showing a 63% return rate for the arthroscopic Bankart cohort and a 73% return for the Latarjet cohort, though there was a 100% rate of return to sport at any level in both cohorts. In a systematic review comparing Bankart repair, the Latarjet procedure, and open stabilization for shoulder instability, patients who underwent the Latarjet procedure returned to their preinjury level of play at basically the same rates (73%) as those who underwent Bankart repair (71%).⁹ Additionally, time to return to sport was minimally faster in the Latarjet group (5.3 months) than in the Bankart group (6.1 months). Likewise, a majority of the studies identified reported very high rates of return to sport at any level after coracoid transfer.^{2-7,10,14,17,18,21} Four studies reported a 100% rate of return to play at any level.^{2,14,17,18} Of the studies that evaluated return at any level, only 1 of the 8 studies reported a rate lower than 80%.⁸

The study with an outlying result was a retrospective review of 29 female patients who underwent a modified Latarjet procedure.⁸ There was a 38% return to any level of sport.

Multiple patients had medical comorbidities that may have influenced surgical outcomes, such as epilepsy and substance use. Additionally, the average age at time of surgery was 37.2 years, which was the highest of the reviewed studies, and may reflect a population less likely to continue participation in sports. The patients in the other studies were mostly male, so the conflicting results may suggest that female patients have a different experience after the Latarjet procedure. Female patients tend to be older at primary dislocation and have a smaller absolute size of the glenoid and coracoid.¹² These differences may affect the outcome of the procedure.

Rates of return to sport at preinjury level were lower than those reported for return at any level. Five of the 11 reviewed articles showed a rate of return less than 73%,^{2,3,11,14,16} which was the rate in a previous systematic review comparing the Latarjet procedure with Bankart repair.⁹ These 5 studies involved a high number of contact or collision sport athletes who likely had a physically demanding preinjury level of play. In a comparison of return to sport in collision versus noncollision athletes, all patients were able to return to sport at any level after 1 year, but the noncollision athletes returned at a significantly higher level than collision athletes.¹¹ At final follow-up, only 1 of 29 (3%) athletes in the collision group was able to return to the same level of play, whereas 8 of 27 (30%) athletes in the noncollision group were able to return to the same level of play.

Table 1. Patient demographics

First Author	Male: Female	Age, y ^a (Range)	Dominant Shoulder	Previous Dislocation, n	Prior Stabilization Procedure	Sport	Level of Play
Beranger ²	46:1	28 ± 8	—	—	—	32% low-impact contact, 32% high-impact contact, 6% overhead, 30% forced overhead	62% recreational, 38% competitive
Bessière ³	89:4	26 (16-46)	37%	34	0%	8% no risk, 47% contact, 12% overhead, 28% high risk/forced overhead, 5% no sport	45% recreational, 38% competition, 12% high level
Blonna ⁴	26:4	31 (19-45)	67%	19	0%	53% collision	—
Bohu ⁵	41:5	18 ± 5	52%	—	0%	—	30% professional, 44% competition, 17% recreational, 9% no sport
Boileau ⁶	56:14	24 ± 7 (17-45)	56%	5	0%	84% high risk (rugby, handball, basketball, judo)	44% competitive
Colegate-Stone ⁷	50:6	24 (16-42)	55%	6	16%	71% rugby, 11% mountain biking, 7% trail running, 5% football, 2% cricket, 2% swimming, 2% jujitsu	Rugby players: 11% professional, 89% competitive
du Plessis ⁸	0:29	37 (20-66)	—	—	14%	Swimming, tennis, horse riding, basketball, running, water-skiing, martial arts, surfing, paddling, mountain biking	—
Kawasaki ¹⁰	—	19 (18-19)	58%	2	0%	100% rugby	13% professional, 39% college, 48% high school
Kee ¹¹	54:2	26 (18-43)	77%	17	75%	52% collision, 48% noncollision	29% competitive, 71% recreational
Neyton ¹⁴	34:0	23 (17-33)	—	—	—	100% rugby	41% professional, 59% competitive local level
Privitera ¹⁶	64:9	25 (15-54)	47%	8	60%	16% hockey, 15% football, 12% basketball, 11% skiing/snowboarding, 8% soccer, 8% wrestling, 18% other contact sport, 12% limited-contact sport	4% professional, 27% college, 26% high school, 40% recreational
Ranalletta ¹⁷	49:0	23 (17-35)	65%	—	63%	100% rugby	100% competitive
Ranalletta ¹⁸	63:2	27 (17-35)	55%	—	100%	66% high-impact/collision, 14% overhead, 14% non-collision/non-overhead, 6% martial arts	83% competitive, 17% recreational
Yoneda ²¹	70:13	21 (16-46)	58%	—	—	35% rugby, 29% football, 17% judo, 11% handball, 8% other contact sport	77% competitive, 23% recreational

—, information was not reported in the study.

^aData reported as mean ± SD (range) where possible.

Table 2. Return to sport

First Author	Year	Study Participants, N	Returned at Same Level, %	Returned at Any Level, %	Change in Sport, %	Time to Return, mo
Beranger ²	2016	47	64	100	21	6.3
Bessière ³	2014	93	72	91	—	—
Blonna ⁴	2016	30	—	83	—	—
Bohu ⁵	2016	46	—	80	—	5.1
Boileau ⁶	2014	70	83	—	—	—
Colegate-Stone ⁷	2015	56	89	—	—	3.2
du Plessis ⁸	2018	29	—	38	—	—
Kawasaki ¹⁰	2018	152	93	—	—	6.3
Kee ¹¹	2018	56	16	96	32	—
Neyton ¹⁴	2012	34	56	100	—	6
Privitera ¹⁶	2018	73	64	—	—	8.1
Ranalletta ¹⁷	2018	49	94	100	8	5.4
Ranalletta ¹⁸	2018	65	95	100	5	5.2
Yoneda ²¹	1999	83	88	92	19	—

—, information was not reported in the study.

Specific demographic factors that predict outcomes in athletes after coracoid transfer have not been identified. In a retrospective review of 47 patients who underwent the Latarjet procedure, practicing an overhead sport was the only significant risk factor for failure to return to preinjury level of sport.² Patient age, sex, number of previous dislocations, level of sport, and hours spent playing sport were not risk factors for failure to return to sport at the same level of play. In a retrospective review of 73 patients, those who had undergone ≥ 2 stabilization procedures prior to the Latarjet procedure had a lower likelihood of returning to their previous level of play.⁸ The rate of return to sport at preinjury level was 64%. Therefore, type of sport and number of previous stabilization procedures may affect rate of return to preinjury level of play.

In 1 retrospective review, only 16% of patients were able to return to their previous level of sport after the Latarjet procedure.¹¹ The reason for this low level of return was not clear. That study included only nonprofessional athletes (71% of which were recreational) who may have been less interested in returning to their previous level of play. Despite the low rate of return to previous level of play, 96% of patients continued playing sports at a lower level.

In the 7 studies that reported recurrent dislocations, rates of instability were low, ranging from 0% to 13.8%, with an average of 3%.^{3,5,6,8,11,16,21} The highest dislocation rate was in a retrospective review of 29 female patients.⁸ The low rate of recurrent dislocation is consistent with a previous systematic review, which found an average dislocation rate of 3.5% after the Latarjet procedure.⁹

This study had several limitations. Most important, the follow-up minimum was only 1 year. Therefore, many athletes had only returned to sport for less than 1 year at follow-up. Consequently, more instability is likely with longer follow-up. This study was also largely limited by the heterogeneity of the data of the included studies. The studies involved athletes of many different types of sports and levels of play. The outcome measures reported were inconsistent, and surgical techniques varied. Many studies included patients who had undergone multiple previous stabilization procedures. These varying factors likely influenced outcomes. Additionally, this study was limited by low levels of evidence. Several of the studies were retrospective case series involving a small cohort of patients. The outcomes reported were also largely short-term. A majority of the studies reported outcomes at a minimum of 2 years or

Table 3. Recurrent dislocations and reoperations

First Author	Year	Study Participants, N	Dislocations	Evacuation of Hematoma	Irrigation and Debridement	Hardware Removal	Revision	Nerve Graft Repair
Bessière ³	2014	93	7	1	1	3	2	— ^a
Blonna ⁴	2016	30	—	1	—	—	—	—
Bohu ⁵	2016	46	0	—	—	—	—	—
Boileau ⁶	2014	70	1	—	—	4	—	—
Colegate-Stone ⁷	2015	56	—	—	1	1	—	—
du Plessis ⁸	2018	29	4	—	—	1	3	—
Kawasaki ¹⁰	2018	152	—	—	2	—	7	—
Kee ¹¹	2018	56	1	—	—	—	—	—
Neyton ¹⁴	2012	34	—	—	—	1	—	—
Privitera ¹⁶	2018	73	6	—	—	1	—	—
Ranalletta ¹⁷	2018	49	—	—	1	1	—	—
Ranalletta ¹⁸	2018	65	—	—	—	1	—	—
Yoneda ²¹	1999	83	1	—	—	—	2	1

—, information was not reported in the study.

less. Therefore, this analysis does not reflect long-term outcomes, and an assessment of long-term outcomes requires further investigation.

CONCLUSION

This systematic review demonstrated a high early rate of return to sport in patients who underwent coracoid transfer for anterior shoulder instability, although patients did not reliably return to the same level of play. The procedure had favorable short-term outcomes for treatment of instability, with low rates of recurrent dislocation and reoperation.

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