Systematic Review

Shoulder Latarjet Surgery Shows Wide Variation in Reported Indications, Techniques, Perioperative Treatment, and Definition of Outcomes, Complications, and Failure: A Systematic Review

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Purpose: To systematically review and compare the surgical indications, technique, perioperative treatment, outcomes measures, and how recurrence of instability was reported and defined after coracoid transfer procedures. **Methods:** A systematic review of the literature examining open coracoid transfer outcomes was conducted according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines using the Cochrane registry, MEDLINE, and EMBASE databases from 2010 to 2020. Inclusion criteria included open coracoid transfer techniques, including the Bristow or Latarjet technique, full text availability, human studies, and English language. **Results:** A screen of 1,096 coracoid transfer studies yielded 72 studies, which met inclusion criteria with a total of 4,312 shoulders. One study was a randomized controlled trial, but the majority of them were retrospective. Of those, 65 studies reported on postoperative outcome scores, complication rates, revision rate, and recurrence rates. Forty-three reported on range of motion results. Thirty studies reported on primary coracoid transfer only, 7 on revision only, and 30 on both primary and revision, with 5 not reporting. Average follow-up was 26.9 months (range: 1-316.8 months). Indications for coracoid transfer, technique, perioperative care, complications, and how failure was reported varied greatly among studies. **Conclusions:** Latarjet and coracoid transfer surgery varies greatly in its indications, technique, and postoperative care. Further, there is great variation in reporting of complications, as well as recurrence and failure and how it is defined. Although coracoid transfer is a successful treatment with a long history, greater consistency regarding these factors is essential for appropriate patient education and surgeon knowledge. **Level of Evidence:** Level IV, systematic review of Level I-IV studies.

Introduction

Despite the commonality of anterior shoulder instability, no agreed upon algorithm exists for its treatment.[1,2] Arthroscopic instability repair is successful, less invasive, and offers lower complication rates when compared with open bone block procedures. However, recurrence has been reported to be higher than open procedures, especially in circumstances with significant bone loss, Hill Sachs lesions, or both.[3,4] Open Bankart repair remains a valuable treatment option and is typically more commonly used in patients who play sports that are at higher risk of recurrent instability or those who failed arthroscopic repair and have recurrent instability without bone loss. Some surgeons advocate for earlier treatment with coracoid transfer, while others reserve the procedure for significant glenoid bone loss. With the recently improved understanding of Hill Sachs lesions and the glenoid track, as well as the development of newer bony augmentation procedures, such as distal tibial allograft, the treatment algorithm for anterior shoulder instability treatment is currently even more disputed.[1,2,5]

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Coracoid transfer, such as the Latarjet or Bristow procedure, extends the glenoid articular arc, while the sling effect of the conjoint tendon is believed to add dynamic stability in abduction and external rotation.[6] Patient-reported outcomes and shoulder stability after Latarjet have been reported as excellent.[7-9] For these reasons, some surgeons are more aggressive in performing this surgery primarily or earlier in the natural history of shoulder instability.[5,10] Conversely, the Latarjet procedure is more invasive then arthroscopic and other open techniques, can be technically challenging, and complications rates have been reported as high as 30%.[11] These include hardware complications and failure, graft malpositioning, and graft osteolysis and resorption.[12]

Treatment decisions and techniques also appear to be quite regional. The Latarjet or coracoid transfer procedure is commonly considered for primary shoulder instability in some areas of the world due to its reliable outcome; conversely, it is reserved in the setting of bone loss and multiple failed previous surgeries in other regions.[3] Latarjet techniques also vary greatly with many possible variations. The size of harvested coracoid graft, handling of the subscapularis muscle, graft positioning and fixation alternatives, method for capsular repair, and adjuncts such as remplissage are only some areas of variability. Beyond indications and surgical techniques, postoperative care and return to activities also differ.

Therefore, the purpose of this study was to systematically review and compare the surgical indications, technique, perioperative treatment, outcomes measures, and how recurrence of instability was reported and defined after coracoid transfer procedures. It was hypothesized that there will be great diversity associated with coracoid transfer procedures in regard to indication for surgery, surgical technique, postoperative care, as well as how outcomes and recurrence rate are reported, and therefore, will pose a challenge in comparing studies.

Methods

Search Strategy and Study Selection

This study followed the Preferred Reporting Items for Systematic Review and Meta-Analysis statement (PRSIMA) guidelines.[13] As this study was a systematic review of published studies, institutional review board (IRB) approval was not required. A systematic literature review was conducted using the PubMed and Scopus/Embase/Cochrane libraries databases and included dates of publication from 2010 through 2020. This computerized search was performed in October of 2020. The terms used included: (Latarjet OR Open Latarjet OR Latarjet procedure OR Bristow OR open Bristow OR Bristow procedure OR Bristow-Latarjet OR coracoid transfer) AND (anterior shoulder instability OR shoulder instability). Two investigators (K.K.T. and L.A.P., medical students), performed a separate, manual study selection from the resulting list to exclude duplicates and to select those specifically related to the relevant items. Studies returned by the literature search were assessed for relevance first based on title, followed by abstract, and lastly, the full manuscript text prior to final study inclusion and data extraction. In case of any discrepancies in article selection between the two investigators, a third investigator was involved (J.W.A.). Previous articles from the literature review and applicable references from the included articles were used if they met the inclusion criteria.

Eligibility Criteria

Clinical outcome studies that included the following criteria were considered eligible: published in the English language, reported clinical and/or functional outcomes, and reported rates of intraoperative and/or postoperative complications following coracoid transfer for the correction of anterior shoulder instability. Studies were excluded when they included any of the following: arthroscopic procedure, human cadaveric studies, animal studies, clinical studies without measures of postoperative outcomes, review articles, case reports, presentations, abstracts, editorial articles, or surveys. There was no minimum follow-up requirement.

Data Extraction and Quality Appraisal

Each study was categorized by the country, number of patients and shoulders, specifics of surgical

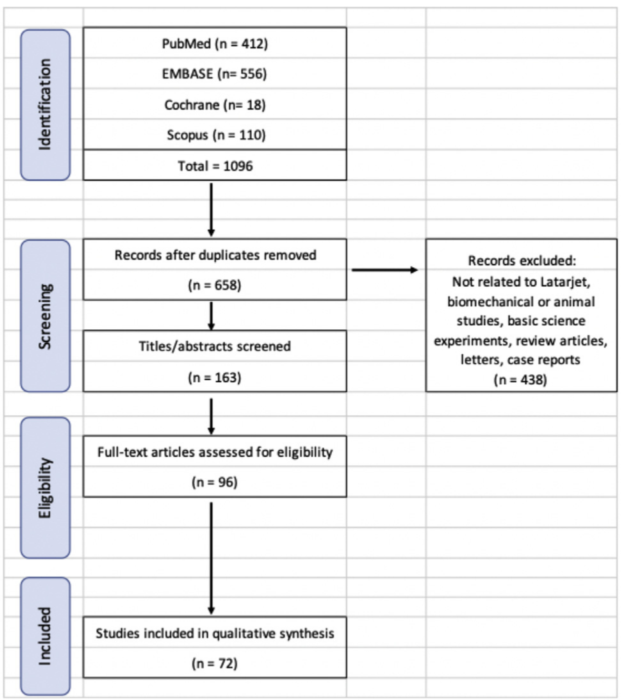

Fig 1. Transparent reporting of systematic reviews and meta-analysis flow diagram outlining the search strategy results from an initial search to those studies that were included.

Table 1. Quality Scoring of Included Studies Based on the MINORS Criteria and Coleman Score

Study	MINORS Score	Coleman Score
Abdelhady et al.	11	61
Ali et al.	20	53
Atalar et al.	12	51
Aydin et al.	15	51
Bah et al.	18	75
Balestro et al.	9	63
Baverel et al.	20	75
Beranger et al.	9	67
Bessiere et al. (2013)	21	65
Bessiere et al. (2014)	21	80
Bhatia et al.	9	61
Bokshan et al.	20	63
Bonnevialle et al.	12	64
Bouju et al.	11	68
Cautiero et al.	10	54
Chaudhary et al.	11	71
Cho et al.	15	53
Colegate-Stone et al.	12	54
Cunningham et al.	19	66
Dauzere et al.	10	59
De Carli et al.	16	57
De l'Escalopier et al.	10	56
Di Giacomo et al.	12	68
Domos et al.	13	75
du Plessis et al.	9	56
Ebrahimzadeh et al.	11	62
Edouard et al.	11	71
Emami et al.	12	64
Ernstbrunner et al.	14	68
Ersen Bayram et al.	16	58
Ersen Birisik et al.	15	69
Flinkkilä and Sirniö	12	64
Flinkkila et al.	21	71
Frank et al.	18	78
Frank et al.	12	69
Gordins et al.	12	63
Gough et al.	11	75
Holzer et al.	9	61
Hovelius et al. (2011)	18	66
Hovelius et al. (2012)	15	73
Ikemoto et al.	11	63
Jeon et al.	19	61
Kawasaki et al.	12	74
Kee et al.	12	68
Kordasiewicz et al.	18	72
Lateur et al.	11	59
Marion et al.	21	71
Metais et al.	15	54
Minkus et al.	9	71
Mizuno et al.	10	60
Mook et al.	14	78
Moon et al.	11	69
Moroder et al. (2017)	13	68
Moroder et al. (2019)	19	72
Moura et al.	10	71
Neyton et al.	12	70
Privitera et al.	11	67
Raiss et al.	12	66
Ranalletta et al.	12	72
Ropars et al.	20	72
Roulet et al.	13	60
Ruci et al.	10	72
Schmid et al.	12	65
Shah et al.	12	63
Tasaki et al.	12	61
Vadala et al.	9	64
Waterman et al.	11	52
Xu et al.	17	68
Yang et al. (2018)	19	64
Yang et al. (2016)	16	68
Zhu et al.	19	78
Zimmermann et al.	15	71

MINORS, Methodological Items for Non-Randomized Studies (score).

technique, postoperative imaging and rehabilitation, range of motion (ROM) measures, postoperative outcome scores, length of follow-up, complications, and recurrence/revision rates, and how those were defined. An assessment of methodological quality was conducted by two reviewers using the Cochrane Collaboration tool.[14] Two authors (K.K.T. and L.A.P., medical students) independently assessed the potential assessed risk of bias of the studies included using the methodological index for non-randomized studies (MINORS), a methodological index for nonrandomized studies[15] and Coleman Score (Table 2).[16] A third tiebreaker (J.W.A.) was designated in the case of discrepancy to resolve the dispute. The items of the questionnaire were scored 0 if not reported, 1 when reported but inadequate, and 2 when reported and adequate. The ideal score was 16 for noncomparative studies and 24 for comparative studies. Studies with a MINORS score of 13 to 16 for noncomparative studies or 21 to 23 for comparative studies were considered at low risk of bias and those ≤12 for noncomparative studies or ≤20 for comparative studies at high risk of bias.

Results

Literature Selection and Risk of Bias

An online database search using the above databases produced a total of 1,096 publications. After nonrelevant and identical articles were excluded, 163 abstracts were evaluated for inclusion. A total of 72 studies were identified for inclusion. A PRISMA flow diagram can be seen in Fig 1 detailing study identification and screening. One study was a randomized controlled trial, one was a Level II study, 23 were Level III studies, and 47 were Level IV studies. No Level V studies were included.

Risk of bias was assessed using MINORS criteria and ranged from 9 to 21 (Table 1). The average MINORS score for noncomparative studies was 11 and 18 for comparative studies. Five noncomparative studies

Table 2. Demographics and Surgical Specifics Reported with Latarjet

Study	Year	Country	Level of Evidence	Sample Size (Shoulders/ Patients)	Mean Age	Male/ Female	Type of Surgery	Subscapularis Handling	Graft Position	No. of Screws	Capsule Repaired to Glenoid	Capsule Repaired to CAL	Capsule Closed Side to Side
Abdelhady et al.	2014	Egypt	IV	14/13	24.4	9/4	Primary	Split	Congruent Arch	2	Yes		
Ali et al.	2020	-	III	-/15	29.5	12/3	Both	Split	Traditional	2		Yes	
Atalar et al.	2013	Turkey	IV	35/35	35	33/2	Both	Split	Congruent Arc	2	Yes		
Aydin et al.	2012	Turkey	III	13/13	29.6	NA	Primary	-	Bristow	1	-	-	-
Bah et al.	2018	France	III	43/43	24.25	7/36	Primary	Split	Traditional	2			
Balestro et al.	2015	France	IV	12/11	28.6	7/4	Primary	Split	Traditional	2		Yes	
Baverel et al.	2018	France	III	110/106	-	88/18	Primary	Split	Traditional	2		Yes	
Group A Competitive Athlete	-	-	-	57/61	21.7	51/6	-	-	-	-	-	-	-
Group B Recreational Athlete	-	-	-	49/49	22.5	37/12	-	-	-	-	-	-	-
Beranger et al.	2016	France	IV	-/47	27.9	46/1	-	Split	Traditional	2		Yes	
Bessiere et al.	2013	France	III	51/51	25	49/2	Primary	-	Traditional	2	-	-	-
Bessiere et al.	2014	France	III	93/90	26	89/4	Primary	Split	Traditional	2		Yes	
Bhatia et al.	2013	India	IV	-/7	25	NA	-	Split	-	2	-	-	-
Bokshan et al.	2017	USA	III	163/163	29.8	134/29	-	-	-	-			
Bonnevialle et al.	2013	France	IV	6/6	33.3	NA	Revision	Takedown	Bristow	1		Yes	
Bouju et al.	2014	France	IV	70/68	26.7	48/20	Primary	Split	Traditional	2	Yes		
Cautiero et al.	2017	Italy	IV	26/25	25.9	23/25	Primary	Split	Traditional	1		Yes	
Chaudhary et al.	2015	India	IV	24/24	31.8	23/1	Revision	Split	Traditional	2		Yes	
Cho et al.	2015	Korea	III	35/35	27.8	32/3	Both	Split	Traditional	2		Yes	
Colegate-Stone et al.	2015	South Africa	IV	-/56	24	50/6	Both	Split	Congruent Arch	2	Yes		
Cunningham et al.	2015	Switzerland	III	-/36	26	34/2	Primary	Split	Traditional	2		Yes	
Dauzere et al.	2016	France	IV	55/54	25.5	67/1	Primary	Split	Traditional	2		Yes	
De Carli et al.	2018	Italy	III	40/40	28	24/16	Primary	Takedown	Traditional	2		Yes	
De l'Escalopier et al.	2018	France	IV	20/20	26.5	N/A	Primary	Split	Traditional	2		Yes	
Di Giacomo et al.	2011	Italy	IV	26/26	28.6	19/7	Primary	Split	Traditional	2	-	-	-
Domos et al.	2019	France	IV	-/99	46	60/39	Primary	Split	Traditional	2		Yes	
du Plessis et al.	2017	South Africa	IV	-/29	37.2	0/29	Both	Split	Traditional	2	-	-	-
Ebrahimzadeh et al.	2015	Iran	IV	36/36	24.6	35/1	Primary	Split	Traditional	2	-	-	-
Edouard et al.	2010	France	IV	-/20	27	20/0	Primary	Split	Traditional	2		Yes	
Emami et al.	2011	Iran	IV	30/30	30.56	30/0	Primary	Split	Traditional	-	Yes		
Ernstbrunner et al.	2019	Switzerland	IV	40/39	48	30/9	Both	Split	Traditional	2		Yes	
Ersen Bayram et al.	2017	Turkey	III	65/62	-	42/20	-	Split	Traditional	2	-	-	-
Group A Epileptic	-	-	-	11/9	31.3	6/3	-	-	-	-	-	-	-
Group B Non-Epileptic	-	-	-	54/53	31.2	36/17	-	-	-	-	-	-	-
Ersen Birisik et al.	2017	Turkey	III	-/48	-	-	Both	-	Traditional	2	-	-	-
Group A Tenotomy	-	-	-	-/20	33.2	18/2	-	Takedown	-	-	-	-	-
Group B Split	-	-	-	-/28	33.9	24/4	-	Split	-	-	-	-	-
Flinkkilä and Sirniö	2015	Finland	IV	-/49	28.4	45/7	Revision	Split	Traditional	2	Yes		
Flinkkila et al.	2019	Finland	IV	-	-	-	-	-	-	-			
Primary		-	-	47/47	32	36/11	Primary	Split	Traditional	2			
Revision		-	-	52/52	33	42/10	Revision	Split	Traditional	2			
Frank et al.	2018	USA	III	-/50	25.4	48/2	Both	Split	Traditional	2			
Frank et al.	2018	USA	IV	133/133	28.5	100/33	Primary	Split	Traditional	2		Yes	

(continued)

Table 2. Continued

Study	Year	Country	Level of Evidence	Sample Size (Shoulders/ Patients)	Mean Age	Male/ Female	Type of Surgery	Subscapularis Handling	Graft Position	No. of Screws	Capsule Repaired to Glenoid	Capsule Repaired to CAL	Capsule Closed Side to Side
Gordins et al.	2014	Sweden	IV	31/31	26.7	23/8	Both	Split	Bristow	1	-	-	-
Gough et al.	2017	England	IV	50/48	27	46/2	Both	Split	Traditional	1	-	-	-
Holzer et al.	2013	Switzerland	IV	-/148	28.4	106/42	-	Takedown	Traditional	1		Yes	
Hovelius et al.	2011	Sweden	III	97/96	27.8	82/15	Both	Split	Congruent Arch	1			Yes
Hovelius et al.	2012	Sweden	III	-	-	-	-	-	-	-			
Series 1	-	-	-	118/-	27	95/23	Both	Split	Congruent Arch	1			Yes
Series 2	-	-	-	167/-	28	142/25	Both	Split	Congruent Arch	1			Yes
Series 3	-	-	-	34/-	26	30/4	Both	Split	Congruent Arch	1			Yes
Ikemoto et al.	2011	Brazil	IV	-/26	28	26/0	-	Takedown + Split	Traditional	2		Yes	
Jeon et al.	2018	Korea	III	31/31	27.4	26/5	Primary	Split	Traditional	2		Yes	
Kawasaki et al.	2018	Japan	IV	176/152	18.9	-	Primary	Split	Bristow	1	Yes		
Kee et al.	2017	Korea	IV	110/110	23.8	100/10	Both	Split	Traditional	2		Yes	
Kordasiewicz et al.	2016	Poland	III	47/-	28	45/2	Primary	Split	Traditional	1 or 2		Yes	
Lateur et al.	2018	France	IV	40/38	34.5	32/6	-	Split	Traditional	1	-	-	-
Marion et al.	2016	France	II	22/22	27.3	16/6	Both	Split	Traditional	2		Yes	
Metais et al.	2016	France	III	-/38	27.8	N/A	Both	Split	Traditional	2		Yes	
Minkus et al.	2019	Germany	IV	29/29	28	25/4	Revision	Split	Traditional	2		Yes	
Mizuno et al.	2014	France	IV	68/60	29.4	54/14	Primary	Split	Traditional	2		Yes	
Mook et al.	2016	USA	IV	38/38	26	33/5	Both	Split	Traditional	2		Yes	Yes
Moon et al.	2015	Korea	IV	44/44	24.5	41/3	Both	Split	Traditional	2		Yes	
Moroder et al.	2017	Austria	IV	25/25	62	13/12	Both	Split	Traditional + Bristow	1 or 2			Yes
Moroder et al.	2019	Germany	I	25/25	31	28/2	Both	Split	Traditional	2		Yes	
Moura et al.	2018	Portugal	IV	102/102	26	89/13	Primary	Takedown	Traditional	1		Yes	
Neyton et al.	2012	France	IV	37/34	23.4	34/0	Primary	Split	Traditional	2		Yes	
Privitera et al.	2018	USA	IV	73/73	25.8	64/9	Both	Split	Traditional	2		Yes	
Raiss et al.	2012	France	IV	14/12	31	10/2	Both	Split	Traditional	2		Yes	
Ranalletta et al.	2018	Argentina	IV	65/65	26.8	63/2	Revision	Split	Congruent Arch	2	-	-	-
Ropars et al.	2015	France	IV	77/75	26.3	54/23	Primary	Split	Traditional	2			Yes
Group A ACR+	-	-	-	-/39	26.1	22/17	-	-	-	-	-	-	-
Group B ACR-	-	-	-	-/38	26.5	32/6	-	-	-	-	-	-	-
Roulet et al.	2019	France	IV	256/262	25.1	222/43	Primary	Split	Traditional	2		Yes	
Ruci et al.	2015	Albania	IV	45/42	-	40/2	Primary	Split	Bristow	1	-	-	-
Schmid et al.	2012	Switzerland	IV	49/49	29	37/12	Revision	Split	Traditional	2		Yes	
Shah et al.	2012	USA	IV	48/47	30	39/9	Both	Split	Traditional	2		Yes	
Tasaki et al.	2015	Japan	IV	40/38	21	37/1	Both	Split	Bristow	1			
Vadala et al.	2017	Italy	IV	24/24	27.2	22/2	Both	Takedown	-	-			
Waterman et al.	2016	USA	IV	65/64	25.9	59/5	Both	-	-	-	-	-	-
Xu et al.	2019	China	III	26/26	31.23	20/6	-	Split	-	2		Yes	
Yang et al.	2018	USA	III	91/91	30	86/5	Both	-	-	-	-	-	-
Yang et al.	2016	USA	III	-	-	-	Both	Split	Traditional	2	Yes	Yes	
Group B with >25% Bone Loss		-	-	12/12	26.5	8/4	-	-	-	-			
Group A with <25% Bone Loss		-	-	42/40	22.3	33/7	-	-	-	-			
Zhu et al.	2017	China	III	44/44	34.8	32/12	Both	Split	Traditional	2	Yes		
Zimmermann et al.	2016	Switzerland	III	93/-	30.8	82/11	Primary	Split	Traditional	2		Yes	

Dashes denote no data available. CAT, coracoacromial ligament.

Tables 3. Perioperative Episode of Care: Imaging, and Postoperative Limitations and Rehabilitation

Imaging		
Type	Preoperative Number of Studies	Postoperative Number of Studies
Radiograph	37	42
CT	32	19
3D CT	15	8
Multiple CTs	0	7
MRI	8	0
CT or MRI	7	0

Postoperative Rehabilitation		
	Number of Studies Reported	Average Length (Days)
Sling	46	21 (0-42)
	Number of Studies Reported	Median Time to Begin (Days)
Formal PT	12	14 (1-90)
Passive ROM	43	1 (0-30)
Active ROM	32	28 (0-90)
External Rotation	22	42 (0-84)
Strengthening	25	56 (42-158)
Return to Sport	43	120 (90-360)

CT, computed tomography; MRI, magnetic resonance imaging; PT, physical therapy; ROM, range of motion; 3D, three-dimensional.

were, therefore, considered low risk of bias, while 4 comparative studies were low risk. Forty (88.9%) noncomparative studies were, therefore, considered high risk of bias, while 24 (85.7%) comparative studies were high risk.

Patient Demographics

A total of 4,312 shoulders were included. Sample sizes ranged from 11 to 262 and were predominantly male (range: 16-100%) with a mean age ranging from 18.9 to 62 years. The average follow-up was 26.9 months (range: 1-316.8 months). Thirty-nine studies were from Europe (20 from France), 15 from Asia, and 9 from the United States (Table 2).

Surgical Procedures Specifics

Thirty studies reported on primary coracoid transfer only, 7 on revision only, and 30 on both primary and revision. Five studies did not indicate whether primary or revision surgeries were included. Seven studies performed a subscapularis takedown, while the rest performed a subscapularis splitting technique. One study that performed a takedown technique included revision Latarjet surgery only, while two included both primary and revision Latarjet surgeries, and the others did not specify. Five studies did not comment on the handling of the subscapularis. Seven studies performed the congruent arc method, while the rest used the traditional method. Fifty-three studies used two screws in their patients, while 15 used a single screw, and 2 studies used a combination of 1 or 2 screws, based on patient specifics. In regard to capsular management, 9 studies repaired the capsule to the glenoid, 39 studies repaired the capsule to the coracohumeral ligament stump, and 7 studies repaired the capsule side to side only, while the remaining studies did not comment on capsular management (Table 2).

Preoperative and Postoperative Imaging

The reporting on the type of preoperative imaging was also limited. Thirty-seven studies noted that they obtained preoperative radiographs. Eight studies obtained MRIs. Thirty-two studies obtained CT scans, 15 3D CTs, while 7 studies obtained CTs or MRIs on all patients (Table 3). The type of postoperative imaging obtained was also sparsely reported. Forty-two studies obtained postoperative radiographs, 19 CTs, 8 3D CTs, and 7 studies obtained multiple postoperative CTs (Table 3).

Postoperative Rehabilitation

Average length of recommended postoperative sling use was 21 days with many studies allowing immediate sling removal and the longest recommending 42 days. The date of the start of formal physical therapy was only reported in 12 studies, which ranged from 1 to 90 days postoperatively with the median being 14 days. When to begin passive range of motion also varied greatly, with the average being 1 day postoperatively (range: 0-30 days). The date of starting active range of motion also varied, with the median being at 28 days (range: 3 days-3 months). External rotation was limited typically for 6 weeks (range: 0-12 weeks), and strengthening was typically started at 8 weeks (range: 6-22.5 weeks). Return to sport was normally allowed at 4 months postoperatively (range: 3-12 months) (Table 3).

Patient-Reported Outcome Measures

Sixty-one studies reported preoperative patient-reported outcome scores with the Rowe score being reported most commonly. Other reported scores included Walch-Duplay, American Shoulder and Elbow Surgeons Shoulder (ASES), organ injury scale (OIS), University of California, Los Angeles (UCLA), Western Ontario Shoulder Instability Index (WOSI), Single Assessment Numeric Evaluation (SANE), Constant, simple shoulder test (SST), Constant-Murley, visual analog scale (VAS), Disabilities of the Arm, Shoulder and Hand (DASH), and subjective shoulder value (SSV). Four studies reported neither preoperative nor postoperative outcome scores. The Rowe score was the most commonly reported postoperative score (47 studies). Tables 4 and 5 show the postoperative scores reported and outcomes from each study evaluated.

Table 4. Patient-Reported Outcome Measures Reported After Latarjet

	Mean Postoperative Outcomes										
Study	Rowe	Walch-Duplay	ASES	Oxford	UCLA	WOSI	SANE	Constant	VAS	SSV	Follow-Up Time (mo)
Abdelhady et al.	91.07 ± 16.6										33.64
Ali et al.	78 ± 11					670 ± 372					30.5 ± 5.25
Atalar et al.	89.1 ± 9.2		91.3 ± 11						1.8 ± 0.6		24 ± 12.2
Aydin et al.	81.9										66 ± 18.3
Bah et al.	92.8 ± 11.3	93.6 ± 13.8							2.8 ± 1.1	89.5 ± 6.3	47.3 ± 9.07
Balestro et al.										90.8 ± 7.5	24
Baverel et al.											
Group A Competitive Athlete	84.2 ± 16.4					196.4 ± 202.5			0.7 ± 0.8	91.5 ± 8.3	44 ± 14.5
Group B Recreational Athlete	69.5 ± 22					357.7 ± 479.5			1.1 ± 1.5	86.1 ± 15.7	49 ± 14.5
Beranger et al.											46.8 ± 9.7
Bessiere et al.			85 ± 13						1.62 ± 1.25	90.9 ± 17.5	66
Bessiere et al.	78 ± 22.5									90 ± 17.5	72 ± 17
Bhatia et al.	95 ± 3.7			12.5 ± 0.7		43.8 ± 31.1					20.6
Bokshan et al.											1
Bonnevialle et al.	82 ± 10.5	70 ± 10								73.3 ± 17.5	40 ± 10.3
Bouju et al.		82.6 ± 15.6				89.7 ± 13.75				91.9 ± 9	156 ± 24
Cautiero et al.	94.7										53 ± 9
Chaudhary et al.	95 ± 7.5										26 ± 1.5
Cho et al.	91 ± 8				32 ± 2				.1 ± 0.3		30.4 ± 11.2
Colegate-Stone et al.											3
Cunningham et al.		91									6.6 ± 5.9
Dauzere et al.		78 ± 12.5								89 ± 8	21 ± 12
De Carli et al.	95.6				32.3	111					
De l'Escalopier et al.	91.8 ± 9.9									89.2 ± 9.7	195.6 ± 27
Di Giacomo et al.											17.5 ± 6.7
Domos et al.	87 ± 7	83 ± 8.5						75 ± 7.75	1.2 ± 2	87 ± 7	156 ± 60
du Plessis et al.						714 ± 456				69.8 ± 23.4	-
Ebrahimzadeh et al.	95.7 ± 3.6				32.1 ± 1.9			96.5 ± 4			37 ± 13.3
Edouard et al.	88.3 ± 17.1	90.8 ± 13.7									21
Emami et al.	77.66										60 ± 18
Ernstbrunner et al.		89 ± 12						81 ± 9		91 ± 13	132 ± 24
Ersen Bayram et al.											39.2 ± 27
Group A Epileptic	93.6		91.7					91			45.2
Group B Non-Epileptic	94.4		93.1					91.7			-
Ersen Birisik et al.											
Group A Tenotomy	96.3 ± 4.1		96.1 ± 2.2								43.8 ± 16.3
Group B Split	93.2 ± 5		91.9 ± 4.9								23.5 ± 8.0

(continued)

Table 4. Continued

Study	Mean Postoperative Outcomes										Follow-Up Time (mo)
	Rowe	Walch-Duplay	ASES	Oxford	UCLA	WOSI	SANE	Constant	VAS	SSV	
Flinkkilä and Sirniö				19.9 ± 7.5		83.9 ± 15.6				84.9 ± 14.8	38 ± 15.25
Flinkkila et al.											-
Primary						85 ± 15				88 ± 13	34.8 ± 16.8
Revision						76 ± 22				80 ± 18	55.2 ± 31.2
Frank et al.			91.06 ± 8.78			74.30 ± 21.84	80.68 ± 7.21		0.67 ± 0.97		45 ± 20
Frank et al.											3
Gordins et al.						85.85 ± 15.27				78.83 ± 18.88	396 ± 6
Gough et al.	88 ± 15		95 ± 1.5							89 ± 2.25	32 ± 17
Holzer et al.											175.2 ± 59.4
Hovelius et al.	87.5					87.8				84.2	204 ± 27
Hovelius et al.											-
Series 1											180 ±19.5
Series 2						85.5				80.1	204 ± 39
Series 3						82.2				75.2	72 ± 9.9
Ikemoto et al.	93				34						38 ± 17
Jeon et al.	91.1 ± 16.1				32.3 ± 3.4				0.2 ± 0.5		30.9 ± 12.25
Kawasaki et al.	87.7					534.3					51.5
Kee et al.	87.6				32.6				1.6		31 ± 21.75
Kordasiewicz et al.	87.8 ± 18.75	83.9 ± 22.5							0.77 ± 1.25		54.2 ± 12.8
Lateur et al.			95.87			42.4375		94.89	0	96.875	48 ± 18
Marion et al.						451 ± 158.7					29.8 ± 4.4
Metais et al.	83.9	85.9									22.7 ± 4.1
Minkus et al.	91 ± 10	89 ± 11.25				76 ± 14.75		90 ± 7.75		82 ± 15	27 ± 1.7
Mizuno et al.	89.6									90.4 ± 15	240 ± 12
Mook et al.			89.2 ± 10.9				87 ± 12.8				38.4 ± 17.7
Moon et al.	90 ± 13				33 ± 2				1.3 ± 0.7		25.9 ± 8.7
Moroder et al. (2017)	77 ± 20		75 ± 21			556 ± 298		65 ± 18	1.4 ± 2.3	70 ± 22	108 ± 39
Moroder et al. (2019)	90 ± 12					250 ± 300				90 ± 15	24
Moura et al.		91.23 ± 11.46									63.96 ± 32.9
Neyton et al.	93 ± 10	86 ± 16.3							1.6 ± 1.4		144 ± 42.3
Privitera et al.			87.9 ± 17.1			557 ± 504			1.3 ± 2.1		51.6 ± 24
Raiss et al.	76 ± 16.3										99.6 ± 57
Ranalletta et al.	90 ± 7								1.4 ± 1		44 ± 21
Ropars et al.	85.2 ± 17.2	81.7 ± 17.2						91 ± 9.5			55
Group A ACR+	83.9 ± 20.1	79.8 ± 18.6						91 ± 7.5			-
Group B ACR-	88.4 ± 15.8	82.3 ± 19.3						91 ± 11.4			-
Roulet et al.											3
Ruci et al.	90 ± 5.5										46 ± 18
Schmid et al.								84.6 ± 15		78.5 ± 25	38 ± 10
Shah et al.			86.3 ± 19.3							81.5 ± 20.4	9.4 ± 12.3
Tasaki e tal.	97.5 ± 1.16										30.5 ± 4.5

(continued)

Table 4. Continued

Study	Mean Postoperative Outcomes									Follow-Up Time (mo)
	Rowe	Walch-Duplay	ASES	Oxford	UCLA	WOSI	SANE	Constant	VAS	SSV	
Vadala et al.	93.8 ± 5				33.5 ± 1	94 ± 5		95.6 ± 3			24
Waterman et al.											28.8
Xu et al.	96.23 ± 2.10		91.54 ± 2.38		31.83 ± 1.35					50 ± 17.5	67.6 ± 3
Yang et al.						352 ± 286	85.3 ± 9.6		1.55 ± 1.88		38.4 ± 30
Yang et al.											-
A: <25% Bone Loss						356 ± 361	85.5 ± 11.4				42 ± 24
B: >25% Bone Loss						475 ± 294	77.1 ± 7.22				42 ± 24
Zhu et al.	97.1 ± 2.5		93.3 ± 9.9					96.5 ± 3.8			37.4 ± 9.4
Zimmermann et al.										88.77 ± 14.63	119 ± 23.2

Data are expressed as means ± SD. Numbers with only a mean did not report standard deviation. Hyphens indicate no data available.

Table 5. Patient-Reported Outcome Measure Specifics

Outcome Characteristics	Studies
Total	87
≥5	4
3 to 4	32
1 to 2	36
0	15
Included Outcomes	
Rowe	47
SSV	30
WOSI	26
VAS	16
Walch-Duplay	16
UCLA	9
Constant	14
SANE	5
ASES	15
Oxford	2

ASES, American Shoulder and Elbow Surgeons Shoulder; SANE, Single Assessment Numeric Evaluation; SSV, subjective shoulder value; UCLA, University of California, Los Angeles; VAS, visual analog scale; WOSI, Western Ontario Shoulder Instability Index.

Postoperative Recurrent Instability, Revision Surgery, and Complications

Sixty studies reported if postoperative dislocation occurred. Of those 12 studies that did not, 4 studies did report on subluxation. Overall, 42 studies reported on subluxation. Apprehension was evaluated in 25 studies. Six studies reported patients had postoperative instability but did not define how that was determined. Eight studies reported on subjective instability. The highest number of dislocations reported in a study was 9 (5.4%), while the highest number of subluxations was 20 (12.0%). The highest number of apprehension events reported was 17 (18.2%) (Table 6).

Sixty-four studies reported an overall complication rate of coracoid transfer surgery with the median being 16.7% (range: 2.3−78.6%). Of the studies that reported complications, graft fracture, nonunion, hematoma, infection, prominent hardware, prominent graft, screw breakage, osteoarthritis, recurrent instability, nerve injury/paresthesia, persistent pain and stiffness, thromboembolic events, and wound healing issues were described (Table 7).

Of the coracoid transfer cases evaluated, 5.1% underwent future revision surgery with the average number being 3 per study (range: 0-26). Of the revisions, 97 revisions were due to recurrent instability (2.2%), while many studies did not report the cause. Other reasons for revision surgery included lateral placement of the graft, screw breakage, screw removal, hematoma, infection, nonunion, and bone block fracture (Table 8).

Discussion

Coracoid transfer surgery varies greatly in its indications, technique, and postoperative care. Further,

Table 6. Recurrence Rates and How They Were Defined

Study	Sample Size (Shoulders/ Patients)	Dislocation	Subluxation	Apprehension	Subjective Instabiltiy	Undefined	Not Evaluated
Abdelhady et al.	14/13	1					
Ali et al.	-/15	1					
Atalar et al.	35/35	0					
Aydin et al.	13/13	0					
Bah et al.	43/43			6			
Balestro et al.	12/11	1	3				
Baverel et al.	110/106						
Group A Competitive Athlete	57/61	2	0	7			
Group B Recreational Athlete	49/49	1	0	5			
Beranger et al.	-/47	0					
Bessiere et al.	51/51	5	1				
Bessiere et al.	93/90	7	2	17			
Bhatia et al.	-/7	0	0				
Bokshan et al.	163/163						x
Bonnevialle et al.	6/6	0	0	2			
Bouju et al.	70/68	1	0	10			
Cautiero et al.	26/25	0					
Chaudhary et al.	24/24	0		1			
Cho et al.	35/35					2	
Colegate-Stone et al.	-/56	0	0				
Cunningham et al.	-/36	0	0	0			
Dauzere et al.	55/54	0	0	2			
De Carli et al.	40/40	0	0	2			
De l'Escalopier et al.	20/20	0					
Di Giacomo et al.	26/26	0	0				
Domos et al.	-/99	6	3	9			
du Plessis et al.	-/29	4	1	2			
Ebrahimzadeh et al.	36/36	0					
Edouard et al.	-/20	1			1		
Emami et al.	30/30	0	0	11			
Ernstbrunner et al.	40/39	0	3	5			
Ersen Bayram et al.	65/62						
Group A Epileptic	11/9	1					
Group B Nonepileptic	54/53	1					
Ersen Birisik et al.	-/48						
Group A Tenotomy	-/20	1					
Group B Split	-/28	0					
Flinkkilä and Sirniö	-/49	1	6				
Flinkkila et al.	-						
Primary	47/47	0	4				
Revision	52/52	0	13				
Frank et al.	-/50						x
Frank et al.	133/133		2				
Gordins et al.	31/31	1	6	1	1		
Gough et al.	50/48	0	1				
Holzer et al.	-/148	3					
Hovelius et al.	97/96						
Hovelius et al.	-	4	6				
Series 1	118/-	4	12				
Series 2	167/-	9	20				
Series 3	34/-	3	9				
Ikemoto et al.	-/26	0		1			
Jeon et al.	31/31						x
Kawasaki et al.	176/152		6				
Kee et al.	110/110	2	4				
Kordasiewicz et al.	47/-	2	1		13		
Lateur et al.	40/38	0					
Marion et al.	22/22	0					
Metais et al.	-/38					2	
Minkus et al.	29/29		1	3		3	

(continued)

Table 6. Continued

Study	Sample Size (Shoulders/ Patients)	Dislocation	Subluxation	Apprehension	Subjective Instabiltiy	Undefined	Not Evaluated
Mizuno et al.	68/60	2	2				
Mook et al.	38/38	3			5		
Moon et al.	44/44	1		1			
Moroder et al.	25/25					1	
Moroder et al.	25/25	0	1	2			
Moura et al.	102/102	0			1		
Neyton et al.	37/34	0	0	5			
Privitera et al.	73/73	6			10		
Raiss et al.	14/12	6					
Ranalletta et al.	65/65	0	0				
Ropars et al.	77/75	4	4	13			
Group A ACR+	-/39	1	3	5			
Group B ACR-	-/38	3	1	8			
Roulet et al.	256/262	0	2				
Ruci et al.	45/42	0					
Schmid et al.	49/49	0	2			5	
Shah et al.	48/47	1			3		
Tasaki et al.	40/38	0	0	0			
Vadala et al.	24/24	0	0	0			
Waterman et al.	65/64		14	1			
Xu et al.	26/26	0	0			0	
Yang et al.	91/91	3	2				
Yang et al.	-						
A: <25% Bone Loss	12/12	0	6				
B: >25% Bone Loss	42/40	1	1				
Zhu et al.	44/44	0	0	0			
Zimmermann et al.	93/-	1	2	8	10		

there is great variation in reporting of complications, as well as recurrence and failure and how it is defined. Although coracoid transfer is a successful treatment with a long history, greater consistency regarding these factors is essential for appropriate patient education and surgeon knowledge. The number of studies that reported details regarding surgical technique, the perioperative episode of care, as well as complications and revision are not sufficient. More importantly, the way recurrence was defined varies greatly with few studies reporting subjective instability and apprehension. Further, few high-level studies exist, as most are Level III or IV, with only one Level I study meeting inclusion criteria. The risk of bias is also high. Future studies and discussion regarding coracoid transfer patient reported outcomes require a more stringent evaluation of continued instability, complications, and a discussion regarding the periepisode of care, as the literature varies greatly, which make comparisons difficult.

Among these studies, indications for coracoid transfer vary greatly. France has the highest number of studies of any country that met inclusion criteria with all 10 studies using the Latarjet in the primary setting. Great debate exists regarding this with many reserving coracoid transfer for off-track lesions or those with recurrent instability who participate in risky activities due to some reports of high complication rates. Most studies used a subscapularis split and the Latarjet technique with traditional graft positioning, rather than the congruent arch technique. Few studies reported whether the capsule was repaired to the glenoid, but the majority performed a coracoacromial ligament repair to the capsule. Further details regarding capsular management in studies are necessary as debate still exists on the ideal capsular management.

The perioperative episode of care also varies greatly in both its reporting and method. Few studies report what imaging was obtained preoperatively or postoperatively. Fifteen of 44 studies obtained CT scans preoperatively (9 obtained 3D CTs), while 11 obtained them on all postoperative patients (4 3D CTs). Five studies obtained multiple postoperative CT scans. Only 3 studies reported that they obtained preoperative MRIs, and none obtained an MRI postoperatively. It is unknown what imaging modalities are required to achieve the best outcomes, with some believing that postoperative CT scan is useful to evaluate graft healing, while others believe that information is not helpful and prefer to rely on patient symptoms and physical examination. Postoperative treatment and physical therapy also varies greatly, with some requiring no sling or formal therapy until 1 month after surgery and others using a sling for 6 weeks with immediate formal therapy. With the lack of consensus and discussion

Table 7. Aggregate Surgical Complications

Study	Nonunion	Fibrotic Union	Hardware	Hematoma	Neurological	Osteolysis	Infection	Sepsis	Stiffness	Pain	Arthritis	Bone Block Failure	Other	Total Complications	Number of Shoulders
Abdelhady et al.															14
Ali et al.	3		1											4	-
Atalar et al.							1					1		2	35
Aydin et al.					1									1	13
Bah et al.													1	1	43
Balestro et al.						8								8	12
Baverel et al.															-
Group B Recreational Athlete	1		2									1	1	5	49
Group A Competitive Athlete			1									2		3	61
Beranger et al.															47
Bessiere et al.	2						1					2		5	51
Bessiere et al.			3	1			1							5	93
Bhatia et al.															7
Bokshan et al.							4	2					3	9	163
Bonnevialle et al.	1													1	6
Bouju et al.	4					9			10	23	3	6		55	70
Cautiero et al.	3													3	26
Chaudhary et al.							1			6				7	24
Cho et al.		2	1		1				1					5	35
Colegate-Stone et al.			1	1	1		1							4	-
Cunningham et al.				2			2							4	-
Dauzere et al.	2			4	1	7				4			1	19	55
De Carli et al.															40
De l'Escalopier et al.											3			3	20
Di Giacomo et al.															26
Domos et al.	5		1	2	3		1		2			4	5	23	-
du Plessis et al.					2	1	1					1	8	13	29
Ebrahimzadeh et al.							1							1	36
Edouard et al.															20
Emami et al.											9			9	30
Ernstbrunner et al.			1							6				7	40
Ersen Bayram et al.															-
Group A Epileptic	1											1		2	11
Group B Non-Epileptic	2											1		3	54
Ersen Birisik et al.															-
Group A Tenotomy												1		1	20
Group B Split															28

(continued)

Table 7. Continued

Study	Nonunion	Fibrotic Union	Hardware	Hematoma	Neurological	Osteolysis	Infection	Sepsis	Stiffness	Pain	Arthritis	Bone Block Failure	Other	Total Complications	Number of Shoulders
Flinkkilä and Sirniö															-
Flinkkila et al.															-
Primary															47
Revision															52
Frank et al.					1		1			2			1	5	-
Frank et al.				1	3		2		1				1	8	133
Gordins et al.		4	2								9	1		16	31
Gough et al.	15				5	3					1		1	25	50
Holzer et al.		3			1	4	1				9		3	21	148
Hovelius et al. (2011)			1	1			2							4	97
Hovelius et al. (2012)															-
Series 1		13		1		2								16	118
Series 2		16	2	1		1	3					1		24	167
Series 3		5												5	34
Ikemoto et al.		2				4					4			10	26
Jeon et al.															31
Kawasaki et al.	19				1		3		3			4		30	176
Kee et al.	2	2	1		3						20			28	110
Kordasiewicz et al.	5		1	2		5	2					2		17	48
Lateur et al.		2										2		4	40
Marion et al.															22
Metais et al.			3	2			2			6	12			25	-
Minkus et al.	1		4				1							6	29
Mizuno et al.											12			12	68
Mook et al.									1			3	1	5	38
Moon et al.		2			1				1		1			5	44
Moroder et al. (2017)			8											8	25
Moroder et al. (2019)	1	1	1	1									4	8	30
Moura et al.			1								8		1	10	102
Neyton et al.		1		1								3		5	37
Privitera et al.			1										5	6	73
Raiss et al.			4									2	1	7	14
Ranalletta et al.			1				1	1					5	8	65
Ropars et al.		-				-					-	-	-	-	-
Group A ACR+	-	5	-	-	-	6	-	-	-	-	2	1	-	14	39
Group B ACR-	-	1	-	-	-	3	-	-	-	-	1	0	-	5	38
Roulet et al.				5	3	5							2	15	265
Ruci et al.		4	1			1								6	45

(continued)

Table 7. Continued

Study	Nonunion	Fibrotic Union	Hardware	Hematoma	Neurological	Osteolysis	Infection	Sepsis	Stiffness	Pain	Arthritis	Bone Block Failure	Other	Total Complications	Number of Shoulders
Schmid et al.									1				5	6	49
Shah et al.	2				5	1	3					1		12	48
Tasaki et al.	3				2		1					4		10	40
Vadala et al.							4			3				7	24
Waterman et al.			4	2	8		4						1	19	65
Xu et al.				2										2	52
Yang et al.	1		3				4					2	1	11	91
Yang et al.															-
A: <25% Bone Loss	1		4			13	3				8	2		31	42
B: >25% Bone Loss	1		2			4					6			13	13
Zhu et al.															44
Zimmermann et al.			2	1									1	4	93
Total	51	61	46	20	33	52	37	1	7	11	93	28	33	473	2831

Hyphens indicate no data available.

regarding these important aspects of the perioperative episode of care, evidence-based recommendations for surgeon and patient education are limited.

The outcome scores used also vary greatly among studies. The Rowe score was the most common postoperative outcome reported with high success rates. The shortest follow-up was 1 month, and the longest was 33 months, demonstrating the importance of long-term studies in the future. The incidence of arthritic change at long-term follow-up is, therefore, not well defined. Even with long-term studies evaluating patient and radiographic outcomes, making evidence-based recommendations would be difficult because of the multiple techniques regarding capsular repair. Studies comparing these variables would be helpful.

The way recurrence was reported also varied greatly. Only eight studies reported on subjective stability and 25 with apprehension of the 72 studies. Most studies reported on subluxation and dislocation. This outlines the need for inclusion of the patient's own beliefs regarding the stability of their shoulder and if they have the confidence in it. Defining recurrence and failure by dislocation alone is not sufficient in expressing the patients true shoulder stability. Further studies and discussions should include these variables to provide a more complete picture of the patients' surgical success.

Of the 2,831 shoulders in which complications were discussed, there were 473 complications reported (16%), with the most common being arthritis (3.3%), followed by graft osteolysis (1.3%) and fibrotic union (2.1%), as well as hardware complications (1.6%). Some studies have reported complication rates up to 30%; this is likely dependent on considerations of what is a complication.[11] Because of few studies obtaining postoperative CT scans, the true incidence of healing rates, graft osteolysis, or fibrotic union is also unknown. However, importance of healing of the graft for a successful outcome is also undetermined. Hardware complications can range from devastating prominent hardware causing complete joint erosion to pain from soft tissue irritation. Much discussion exists regarding the high incidence of hardware issues with coracoid transfer. Special care must be taken for appropriate placement and of the graft and hardware to minimize this important issue.

The majority of studies did report on the incidence of reoperation with an overall incidence of 5.1%. Recurrent instability (1.4%) and hardware issues (1.9%) were the main reasons for revision surgery. Although these numbers are not exorbitantly high, the incidence of repeat instability remains after the coracoid transfer. Many believe that no matter the bone loss or clinical scenario, the coracoid transfer will be sufficient; however, published reports regarding evaluating the on-track concept after the addition of the bone block are important.[17]

Table 8. Aggregate Revision Reasons

Study	Recurrent Instability	Hematoma	Hardware	Infection	Nerve issue	Stiffness	Other	Total Reoperations	Number of Shoulders
Abdelhady et al.								0	14
Ali et al.	1							1	15
Atalar et al.			1	1				2	35
Aydin et al.								0	13
Bah et al.	1							1	43
Balestro et al.	1							1	12
Baverel et al.									
Group A Competitive Athlete	2		1					3	61
Group B Recreational Athlete			2					2	49
Beranger et al.								0	47
Bessiere et al.	1		1	1				3	51
Bessiere et al.	2	1	3	1				7	93
Bhatia et al.								0	7
Bokshan et al.								0	163
Bonnevialle et al.								0	6
Bouju et al.								0	70
Cautiero et al.								0	26
Chaudhary et al.								0	24
Cho et al.								0	35
Colegate-Stone et al.	0		1	1				2	
Cunningham et al.								0	36
Dauzere et al.	0		4					4	68
De Carli et al.	0							0	40
De l'Escalopier et al.	0						1	1	20
Di Giacomo et al.								0	26
Domos et al.	6	1	1			1	2	11	99
du Plessis et al.	3		1					4	29
Ebrahimzadeh et al.								0	36
Edouard et al.								0	20
Emami et al.								0	30
Ernstbrunner et al.			2				5	7	40
Ersen Bayram et al.									
Group A Epileptic			1					1	11
Group B Non-Epileptic								-	54
Ersen Birisik et al.									
Group A Tenotomy	1							1	20
Group B Split								0	28
Flinkkilä and Sirniö	1							1	49
Flinkkila et al.								0	
Primary								0	
Revision	0						1	1	
Frank et al.	0			1	1		1	3	42
Frank et al.	2			2	1		1	6	12
Gordins et al.	1							1	31
Gough et al.								0	50
Holzer et al.								0	148
Hovelius et al. (2011)	1		4					5	319
Hovelius et al. (2012)			6	1			3	13	97
Series 1	0							0	
Series 2	2							2	110
Series 3								0	47
Ikemoto et al.								0	26
Jeon et al.	0							0	38
Kawasaki et al.	4			2		2	3	11	176
Kee et al.	2							2	29
Kordasiewicz et al.	3		1					4	68
Lateur et al.							1	1	40
Marion et al.								0	22
Metais et al.		2	3					5	25
Minkus et al.	2		4	1				7	30
Mizuno et al.	1							1	47

(continued)

Table 8. Continued

Study	Recurrent Instability	Hematoma	Hardware	Infection	Nerve issue	Stiffness	Other	Total Reoperations	Number of Shoulders
Mook et al.	3					1	1	5	38
Moon et al.								0	44
Moroder et al. (2017)	1		8					9	52
Moroder et al. (2019)	0		1					1	265
Moura et al.	1		1					2	102
Neyton et al.			1					1	37
Privitera et al.	4		1					5	73
Raiss et al.	5							5	14
Ranalletta et al.			1	1				2	65
Ropars et al.								0	77
Group A ACR+								-	-
Group B ACR-								-	-
Roulet et al.								0	52
Ruci et al.			1				1	2	45
Schmid et al.								0	49
Shah et al.	3			3				6	48
Tasaki et al.	0						2	2	167
Vadala et al.								0	34
Waterman et al.	4		3	3			2	12	65
Xu et al.	26							26	40
Yang et al.	2						4	6	91
Yang et al.								0	24
A: <25% Bone Loss	2		4	3				9	26
B: >25% Bone Loss	2		2					4	
Zhu et al.								0	
Zimmermann et al.	1	1	2				1	5	93

A high risk for bias was seen in nearly all the studies. This combined with the lack of standardized reporting on outcomes and revision, as well as how instability is defined, makes comparison of published data difficult. This likely stems from the varying indications, much of which is region dependent. Greater transparency with these factors is essential from indications, the episode of care, and postoperative outcomes and follow-up to determine treatment success is needed.

Limitations of this study include the many variations of coracoid transfers, including both Bristow and Latarjet techniques. Restricting this to Latarjet procedures was considered, but it was believed that many of the international studies would be excluded and, therefore, would bias this evaluation to mostly the European and the U.S. experience. Further, arthroscopic coracoid transfers were excluded. The authors also believe that because of the breadth of techniques, these all should be represented to give the most accurate evaluation of coracoid transfer procedures, in general. Indications for coracoid transfer also likely bias these results, as performing a Latarjet after multiple arthroscopic and open stabilization procedures may have greater risk of instability when compared with the Latarjet done in the primary setting. Inherent to most systematic reviews, many of the included studies had missing or incomplete data making proper evaluation difficult. The authors attempted to compare surgical indications among studies; however, the majority lacked these specific details, which made these assessments inaccurate and incomplete.

Conclusions

Latarjet and coracoid transfer surgery varies greatly in its indications, technique, and postoperative care. Further, there is great variation in reporting of complications, as well as recurrence and failure and how it is defined. Although coracoid transfer is a successful treatment with a long history, greater consistency regarding these factors is essential for appropriate patient education and surgeon knowledge.

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