

Anterior Shoulder Instability

A Systematic Review of the Quality and Quantity of the Current Literature for Surgical Treatment

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Background: Anterior shoulder instability is the most common sequela of shoulder dislocation and can result in repeated dislocations or subluxation of the glenohumeral joint. Anterior shoulder instability can be treated conservatively or surgically with several procedures.

Purpose: To date, arthroscopic Bankart is the most common surgical procedure for the treatment of anterior shoulder instability. No previous studies have compared all anterior shoulder surgical procedures. In this study, the authors performed a systematic review of journal articles describing all surgical procedures for anterior shoulder instability to determine the scientific evidence and level of recommendation.

Study Design: Systematic review; Level of evidence, 4.

Method: A comprehensive literature search was conducted (July 19, 2016) with 4 reputed databases: PubMed, EMBASE, the Cochrane databases, and Web of Science. The articles found in the literature search were screened by 2 reviewers on the basis of their titles, abstracts, and full text. Data were extracted from relevant studies, and potentially relevant records were selected for full-text review. Included articles were classified according to their scientific quality (level of evidence, 1-5). The studies were then combined for each surgical procedure, and a grade of recommendation was assigned for each procedure: grade A, treatment recommendation based on level 1 evidence studies; B, based on level 2 or 3 evidence studies; C, based on level 4 or 5 evidence and could represent conflicting results; or I, insufficient evidence to recommend a treatment. As such, the grade of recommendation provides a summary score for the quality and quantity of available literature to support the surgical procedures reviewed here.

Results: The systematic literature review generated 11,281 articles. After screening, 655 articles were included. Results revealed 31 surgical procedures for shoulder instability following dislocation: 10 surgical procedures were given an A or B recommendation; 11, a C recommendation; and 10, an I recommendation.

Conclusion: This review identified many surgical procedures to treat anterior shoulder instability. Ten of these surgical procedures had an abundant amount of published articles to describe their safety and efficacy. Arthroscopic Bankart and open Bankart were the most commonly reported procedures that cite satisfactory postoperative outcomes and limited complications. Publications on the other surgical procedures were less common. Surgeons should be careful when recommending surgery, and they should choose the appropriate surgical procedure based on evidence-based literature.

Keywords: shoulder; glenohumeral; instability; dislocation; surgery

Anterior shoulder instability occurs when the humerus translates anterior to the glenoid, and it is the most common form of shoulder instability. Shoulder instability can occur for a variety of reasons, and over the years, different procedures and techniques have been developed with respect to specific indications. The number of pathologic conditions in the glenohumeral joint include joint laxity, labral tears, and ligament injuries, as well as bone defects in the humeral head (Hill-Sachs lesion) and/or the glenoid.

Anterior shoulder instability can be treated either non-operatively or operatively by numerous procedures, such as open Bankart,^{16,17} arthroscopic Bankart,^{4,10} Latarjet,^{1,3} Bristow,^{76,77} and older techniques, such as Putti-Platt^{72,74} and Magnuson-Stack.^{2,24} Arthroscopic and open Bankart procedures are performed on patients with glenoid labral tears. The indication for the Latarjet procedure is glenoid bone loss. The coracoid process is cut and transferred with the conjoined tendon through a horizontal incision in the subscapularis tendon. Bristow surgery is similar to that of the Latarjet; however, just the coracoid process is transferred to the glenoid with its muscle attachments. The Putti-Platt and Magnuson-Stack procedures are

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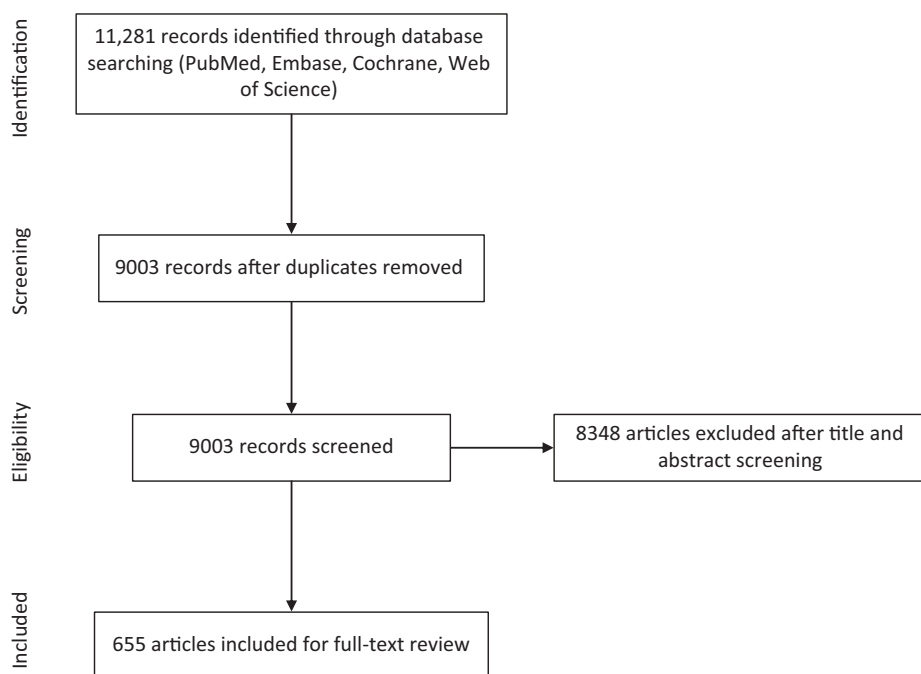


Figure 1. PRISMA (Preferred Reporting Items for Systematic Meta-Analyses) flow diagram: the search process for published literature from the online databases that met the inclusion criteria for this study.

nonanatomic historical procedures that involve tightening of the subscapularis tendon.

In recent years, many of these surgical procedures have been performed arthroscopically and have shown promising results.⁷ Systematic reviews comparing operative and nonoperative treatment and certain surgical procedures have been published,⁴⁴ but never has a systematic review evaluated all surgical procedures for anterior shoulder dislocation. The aim of this systematic review was to determine the quantity and quality of the available scientific evidence supporting all surgical procedures for anterior shoulder dislocations.

METHODS

A comprehensive literature search was performed of the following databases from their inception dates to July 19, 2016: PubMed, EMBASE, Cochrane databases, and Web of Science. The search strategy developed for PubMed, which was modified for other databases, was as follows: the search terms [Shoulder (MeSH) OR Glenohumeral] AND [Dislocation OR Shoulder Dislocation] AND [Anterior] AND [Surg* (MeSH) OR Operation (MeSH) OR Orthopedic] with filters: English. The search terms included 3 concepts: anterior shoulder dislocations, glenohumeral joint, and surgical

procedures. All published clinical studies with English translation were included. This systematic review excluded non-English studies, cadaveric studies, biomechanical studies, nonhuman studies, review articles, shoulder instability studies (without dislocation), and posterior and inferior shoulder dislocation studies.

The methods for the comprehensive review of the literature are found in the PRISMA (Preferred Reporting Items for Systematic Meta-Analyses) flow diagram (Figure 1). All records found in the literature search were screened by titles and abstracts. Articles were considered relevant and selected for full-text review if they did not include any of the exclusion criteria. Articles were then classified into levels 1 to 5 according to their quality of evidence (ie, research method) per the criteria of Wright et al.⁸⁷ If the level of evidence for the article was assigned by its publication journal, then that was used. If the level of evidence was not preassigned by the author or the journal, the methods of Wright et al.⁸⁷ were used to assign a level of evidence, as agreed on by all authors of this review. Articles that described case series with <5 patients, had poor quality data collection, or were written on only the basis of expert opinion were classified as level 5 evidence. Randomized controlled trials were considered the highest-quality studies and were classified as level 1.

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TABLE 1
Quality and Quantity of the Current Literature on Anterior Shoulder Instability

Surgery Type	Level of Evidence, No. of Studies					GOR ^a	Recommendation
	1	2	3	4	5		
Arthroscopic Bankart ^b	19	35	23	173	9	A	For
Open Bankart ^c	13	21	23	55	2	A	For
Latarjet ^{1,3,12}	1	6	9	72	8	A	For
Putti-Platt ^{72,74,88}	1	2	7	24		A	Against
Arthroscopic remplissage ^{53,59}		2		7	1	B	For
Remplissage ⁴²		1	1	4	1	B	For
Arthroscopic lavage ⁸²⁻⁸⁵	2	2				B	For
Bristow ^{76,77,89}		1	2	16	3	B	Against
Open capsular shift ^{47,58}	1	3	3	14		B	Against
Thermal capsulorrhaphy ^{15,28,35,36,46}	2	4	4	22	4	B	Inconclusive data
Arthroscopic Latarjet ^{13,14,25,26,32}			1	7	2	C	For
Open J graft ^{66,67}			1	5	1	C	For
Latarjet-Patte ⁶⁸				3	1	C	For
Iliac crest bone graft ^{65,78}				7		C	For
Magnuson-Stack ^{2,24,52}			3	9		C	Against
Bankart and remplissage ^{40,70}		1	1	2		C	Against
Eden-Hybbinette ^{23,30,43}			4	12		C	Against
Boytchev ^{45,79}			1	10		C	Against
Arthroscopic staple capsulorrhaphy ⁵⁰			1	6		C	Against
Stapling operation ^{31,38}				7		C	Against
Caspari technique ⁵¹		1		5		C	Against
Bankart and Bristow ⁵				3		I	
Weber derotation osteotomy ²²				2		I	
Arthroscopic Bristow-Latarjet-Bankart ¹⁹			1	2		I	
Bankart and capsulorrhaphy ⁶¹				2		I	
Neer T-plasty with Bankart ⁶⁹		1		1		I	
Nicola operation ^{57,81}				2	1	I	
M. Lange ⁶⁰			1	4		I	
Bankart-Delitala ⁵⁶				2		I	
Arthroscopic capsuloplasty ^{73,75}				3		I	
Spaso technique ^{90,91}				1	1	I	

^aGOR, grade of recommendation per Wright et al.⁸⁶

^bReferences 4, 6-10, 20, 21, 26, 37, 41, 44, 48, 49, 54, 55, 62-64, 71, 80.

^cReferences 11, 16-18, 27, 29, 33, 34, 39, 49, 54, 62, 63, 71.

After assignment of quality of evidence (levels 1-5), articles were grouped and analyzed according to surgical procedure. Each surgical procedure was given a grade of recommendation (A, B, C, or I) for or against the procedure, according to Wright et al.⁸⁶ Grade A recommendations are based on consistent level 1 studies, while grade B recommendations consist of level 2 or 3 evidence studies. Grade C recommendations are based on level 4 or 5 evidence and could represent conflicting results. Grade I articles have insufficient evidence to recommend a treatment. As such, the grade of recommendation provides a summary score of the quality and quantity of available literature to support the surgical procedures reviewed here.

RESULTS

The comprehensive literature searches of the 4 electronic databases generated 11,281 articles. After duplicates were removed and articles were screened by title, abstract, and full-text

review, 655 articles met the inclusion criteria, generating 31 surgical procedures for anterior shoulder dislocations (Table 1).

Four surgical procedures were given a grade A recommendation. Arthroscopic Bankart, open Bankart, and Latarjet were all given a grade A in favor of recommendation, whereas the Putti-Platt procedure was given a grade A against recommendation. There were 259 articles on arthroscopic Bankart, including 19 level 1 studies[§] describing several merits, such as lower rates of recurrent instability, fewer postoperative complications, and increased range of motion and strength, as well as an increased outcome score. There were 114 articles on open Bankart, including 13 level 1 studies.^{||}

Six surgical procedures were given a grade B recommendation. Ten articles were included for arthroscopic

[§]References 4, 6-10, 20, 21, 26, 37, 41, 48, 64.

^{||}References 11, 16-18, 27, 29, 33, 34, 39, 49, 54, 62, 63, 71.

remplissage, 7 for remplissage, and 4 for arthroscopic lavage. These 3 procedures were given a grade B in favor of recommendation and were supported by the literature. Bristow and open capsular shift surgical procedures were given a grade B against recommendation. There were 36 articles on thermal capsulorrhaphy, and it was determined to have conflicting recommendations.

Of the 11 grade C surgical procedures, 7 were given a grade C against recommendation: Magnuson-Stack, Bankart and remplissage, Boytchev, Eden-Hybbinette, arthroscopic staple capsulorrhaphy, stapling operation, and Caspari technique. The 4 surgical procedures given a grade C in favor of recommendation were open J graft, arthroscopic Latarjet, Latarjet-Patte, and iliac crest bone graft.

Of the 31 surgical procedures, 10 were given an I recommendation because of insufficient evidence (Table 1).

DISCUSSION

Of the 4 surgical procedures that were graded A, Putti-Platt was not recommended. Few articles provided adequate support for using this surgical procedure, as it is an old procedure and the published literature is out of date. Furthermore, the redislocation rate is very high for the Putti-Platt surgical procedure, and range of motion is compromised.^{72,74,88} Based on the findings, the Putti-Platt procedure is not recommended as a treatment option for anterior shoulder instability. There was abundance of literature on arthroscopic and open Bankart repair. Systematic reviews and meta-analysis mentioned that open Bankart was superior to arthroscopic Bankart, with a lower recurrence rate and no significant difference in complication rate.^{6,41} Some level 1 randomized controlled trials comparing arthroscopic Bankart and open Bankart showed comparable postoperative results in terms of stability, range of motion, and complications.^{20,37} However, other level 1 studies suggested that both surgical procedures are adequate, with arthroscopic Bankart offering better postoperative results, such as greater stability, fewer complications, and better range of motion.⁵⁵ The Latarjet procedure was reported to have promising results, including lower recurrence rates, high graft union, satisfactory outcome scores, and fewer complications.^{1,3,12}

Of the procedures that were graded B in favor of recommendation, arthroscopic remplissage was reported by several studies to have no restriction of movements, improved outcome scores, fewer complications, and early return to sports activities.^{53,59} The remplissage procedure also showed a high stability rate, increased range of motion, and early return to sports activities.⁴² Several randomized and nonrandomized studies reported beneficial results of arthroscopic lavage, including a lower recurrence rate, a higher stability rate, improved outcome scores, and reduced effusion in the glenohumeral joint,⁸²⁻⁸⁵ ultimately leading to higher patient satisfaction.

There were 2 procedures that were graded B against recommendation: the Bristow procedure and open capsular shift. Bristow is a relatively old technique, with advantages such as improved range of motion and being a safe surgical

technique. However, this technique also has a number of complications, including recurrent painful anterior instability, injury to the articular cartilage, loosening of the screw, neurovascular injury, and posterior instability.^{76,77,89} Open capsular shift is an uncommon surgical procedure reported to have complications such as synovial and vascular reaction of the glenohumeral joint.^{47,58} As such, it is not surprising that the findings of this review revealed mainly level 2 or 3 studies with consistent findings against recommending Bristow and open capsular shift.

Thermal capsulorrhaphy was deemed conflicting; as such, more high-quality studies are necessary in this area. Few articles showed complications when thermal capsulorrhaphy²⁸ was performed on its own, such as recurrence, stiffness, axillary nerve injuries,¹⁵ high unsatisfactory rate of pain, recurrent instability, return to work/sports, and outcome scores. However, some studies suggested that thermal capsulorrhaphy enhances outcomes when performed with other surgical procedures, such as arthroscopic Bankart.⁴⁶

Of the procedures that were graded C in favor of recommendation, arthroscopic Latarjet has been practiced by surgeons for the treatment of anterior shoulder instability with satisfactory outcome scores and stability rate as well as few complications, such as apprehension and dislocation.^{13,14,25,26,32} Open J bone graft was also indicated for the reconstruction of glenoid bone, which had satisfactory graft positioning and bone remodeling; however, it is not practiced widely.^{66,67} The Latarjet-Patte procedure was used on rugby players in 1 study and demonstrated excellent outcomes regarding stability and early successful return to rugby playing.⁶⁸ One study showed that glenoid reconstruction with iliac crest autograft had positive results in terms of stabilization and outcome score,⁷⁸ while 1 study mentioned graft osteolysis and an unsatisfactory clinical outcome.⁶⁵

Seven procedures were graded C against recommendation: Magnuson-Stack,^{2,24,52} Bankart and remplissage,^{40,70} Eden-Hybbinette,^{23,30,43} Boytchev,^{45,79} arthroscopic staple capsulorrhaphy,⁵⁰ stapling operation,^{31,38} and Caspari technique.⁵¹ These techniques are not commonly used and are reported to have adverse postoperative findings, such as redislocation, reduced range of motion, and infections. Moreover, there was not a sufficient number of articles available to convince us to recommend these procedures as a suitable treatment option for anterior shoulder instability.

The limitations of this study include the lack of ability to access all articles on each surgical procedure, as a number of surgical procedures that are not used anymore have few quality studies published. It is possible that publications exist but were never transferred to web databases and thus cannot be found. It is also possible that the information in these articles is out of date. Some surgical procedures that received an I recommendation are new techniques and surgical procedures that require further research before being supported by the literature. The large scope of the study and the broadness of the topic make it difficult to draw specific conclusions. If this study were to be repeated, the topic should be focused on a narrower research question.

Another limitation stems from the number of pathologic conditions in the glenohumeral joint, such as joint laxity, labral tears, ligament injuries, as well as bone defects in the humeral head (Hill-Sachs lesion) and/or the glenoid. As such, the various surgical procedures reviewed in this study may be more tailored for one pathologic identity of shoulder instability than another. Thus, per our conclusion, we recommended not only taking into account the quality and quantity of evidence reviewed here but also considering the pathology involved in the patient's instability.

CONCLUSION

A comprehensive review provided abundant literature on anterior shoulder dislocation, with ample studies ranging from level 1 to level 5. It is evident that the arthroscopic and open Bankart procedures have been heavily studied and are well supported by the literature. Future research should focus on various aspects of the Bankart procedure to optimize results, such as suture type, suture location, rehabilitation, and so on. With the quantity and quality of the literature to support several surgical procedures for the treatment of anterior shoulder dislocations, surgeons should ensure that their procedure of choice is supported by the literature and are appropriate for each patient's needs and the specific indications that each procedure provides. In summary, this study provides a single comprehensive source of the available literature on the surgical procedures for anterior shoulder instability.

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