

Complications of Surgical Treatment of Anterior Shoulder Dislocation: A Systematic Review

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Abstract

Introduction: shoulder joint has the greatest range of motion in the human body. The shoulder anatomy promotes high mobility and favors relative sacrifice of articular stability, making it susceptible and more prone to events of instability and dislocation. This review aimed at identifying main complications of surgical treatment of anterior shoulder dislocation. **Methodology:** This systematic review was conducted according to the International Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Studies which were eligible for this systematic review included: English or Spanish language, studies published from 2000, which mentioned surgical complications of anterior shoulder dislocation in their results, both in open and arthroscopic surgery. Included studies which were required to have at least 1 complication following surgical repair. Only studies from original data were included. **Results:** We found 228 potentially eligible studies for the survey. Through the inclusion and exclusion criteria and after consensus among reviewers, we chose 9 studies to compose the systematic review. **Conclusion:** Important information emerges: recurring instability, recurring dislocation, external rotation limitation and arthritis are main surgical complications of anterior shoulder dislocation.

Keywords

Surgical Complications, Anterior Shoulder Dislocation and Recurrences

1. Introduction

The shoulder joint has the greatest range of motion in the human body. Its anatomy promotes high mobility [1] and favors relative sacrifice of articular stability, making it susceptible and more prone to events of instability and dislocation [2] [3]. The mechanism of injury often occurs due to a trauma that combines abduction, hyperextension and external rotation of the shoulder. This mechanism conditions the anterior glenohumeral dislocation or subluxation causing ruptures of the joint capsule and pulling of glenoid labrum in its antero-inferior portion, *i.e.* the Bankart lesion. The glenoid defect may be due to a primary fracture or due to a bone lesion caused by episodes of repeated subluxations or dislocations, and it is commonly observed in patients with anterior shoulder dislocation [4] [5]. The glenoid bone defect proved to alter normal shoulder kinematics, resulting in shoulder anterior instability and additional re-dislocation [5] [6].

The paradigm of these lesions is anterior dislocations and anterior instability. Thus, it is estimated that the shoulder dislocation has incidence of 23.9/100,000, and 98% correspond to previous dislocations. With a peak of bimodal incidence, the 15 - 29 age group shows 46.8% of shoulder dislocations, with another peak of incidence in the group of 61 - 80 age related to low-energy trauma [7] [8]. A review of the National Collegiate Athletic Association (NCAA) analyzed an injury surveillance system during the years 1989 to 2004 reporting 2080 glenohumeral instabilities in various sports and equating the rate of injuries in 0.12/1000 exposed athletes, most in sports such as football, wrestling and hockey [9] [10].

Articular shoulder lesions and the number of recurrences (dislocations or subluxations) associated with anterior shoulder instability are determinant in their therapeutic approach [11]. The best knowledge of contributing factors of complications in each treatment increases the high importance of preventing adverse effects resulting from therapeutic management.

In addition to the general complications of surgery and recurrent shoulder instability, other problems were described after surgical stabilization. The most commonly encountered complications are pain, loss of motion, infection, implant release, neurovascular injury, and late articular degeneration. After arthroscopic stabilization, neurovascular lesions, adhesive capsulitis and synovial fistula are found. Other complications are specific to the surgical technique used for Bankart lesion and include laxity, fractures and interlocking after using clamps, suprascapular nerve lesions and pain after transglenoid repair [12] [13].

Complications related to the surgical treatment of anterior shoulder dislocation in the orthopedic and traumatology services are common worldwide. The analysis of the current literature shows lack of consensus regarding the complications of surgical treatment of instability and anterior shoulder dislocation, and which therapeutic approach guarantees the best results, especially in relapsing situations. In this sense, this review identified main complications of surgical treatment of anterior shoulder dislocation.

2. Methods

2.1. Literature Search Strategy

This systematic review was conducted according to the International Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. We performed searches on the PubMed and LILACS electronic databases in July 2017. To achieve the maximum sensitivity in the search strategy, we used the descriptor “anterior shoulder dislocation” according to the Medical Subject Headings (MeSH).

2.2. Eligibility Criteria

Studies eligible for this systematic review included: English or Spanish language, studies published from 2000, which mentioned surgical complications of anterior shoulder dislocation in their results, both in open and arthroscopic surgery. Included studies were required to have at least 1 complication following surgical repair. Only studies from original data were included. Abstracts, case report, qualitative study, conference presentation, editorial, review, cross-sectional study, biomechanical study, pilot study, cohort, studies addressing cancer patients, pediatric-patient studies and expert opinions were excluded.

2.3. Qualitative Evaluation

Two independent reviewers (L.O.C and J.P.P.S) evaluated each article and found agreement on any disagreement about including or excluding studies due to controversy in their selection. The International Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist were used to evaluate the quality of studies. Two orthopedic surgeons (W.H.B.N and P.R.M.S.S) were consulted on the included references.

2.4. Extracted Data

Data were extracted from texts, tables and figures of all articles included in the study.

2.5. Selection Steps

Procedures were organized following the International Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines: at first, we conducted a survey of studies on the databases using the proposed descriptors; secondly, we have removed studies in duplicate; and subsequently we selected studies from the title, abstract and formation of a systematized database. In the eligibility stage, selected studies were read in full and stored in a new database. In the inclusion stage, we discussed studies according to the pertinent literature to establish consensus and divergent points in the literature and produce a critical summary summarizing the information provided by the included articles.

3. Results

We found 228 potentially eligible studies for review and 4 duplicate studies were removed. Initially, reviewers L.O.C and J.P.P.S evaluated titles and abstracts of these publications, and 192 references were excluded. After selection through the abstracts, we selected 32 studies that were read in full by the two independent reviewers. The complete reading of studies resulted in the exclusion of 7 articles in the German language [14]-[20], 2 studies that did not involve surgical procedures [21] [22], 9 studies without surgical complications [23]-[31], 3 studies comparing the types of sutures [32] [33] [34], 1 study published before 2000 [35] and 1 study with impossibility of access [36]. Through the inclusion and exclusion criteria and after consensus among reviewers, 9 studies were selected to compose the systematic review [37]-[45] (**Figure 1**).

A total of 1016 patients were investigated in the 9 studies included in this systematic review. Open surgery was used in 175 of these patients, while arthroscopic surgery occurred in 216 patients. Forty-two patients underwent capsular arthroscopic lavage, 31 were submitted to T-plasty procedure and Bankart repair. The coracoid process transfer occurred in 219 patients and 217 were submitted to open soft tissue reconstruction. Thirty-one patients underwent modified and anatomically oriented anteroinferior capsule change and Bankart repair, and 25 patients underwent surgery using the Boytchev technique. The average follow-up was five years and eight months; minimum follow-up of one year and eight months and maximum follow-up of 13 years and four months. Papers selected for this Systematic Review are summarized in **Table 1**.

In this systematic review, we identified 227 surgical complications of anterior shoulder dislocation. Complications included: 22 returns of instability, 40 returns of dislocation, 1 infection, 104 osteoarthritis, 11 external rotation limitations, 2 erythema, 3 adhesive capsulitis, 8 recurrent subluxations, 5 laxity with

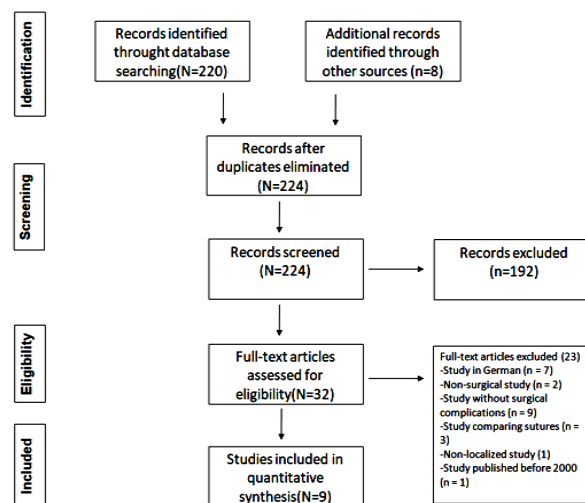


Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram. From the initial 228 records, 9 studies were included.

Table 1. Summary of articles included.

Author	Year	Level of Evidence	Country	Average follow-up period	Case procedure (n)	Control procedure (n)	Complications (n)
Netto <i>et al.</i>	2012	Grade II	U.S.	3 years and 2 months	Treatment of Bankart lesion by open technique [25]	Bankart lesion repair by arthroscopy [17]	Case Procedure: Infection [1] Control Procedure: Return of instability [2]
Mahiroğullari <i>et al.</i>	2010		Turkey	2 years and 2 months	Treatment of Bankart lesion by open technique [30]	Bankart lesion repair by arthroscopy [34]	Case Procedure: Return of dislocation [1] Control Procedure: Return of dislocation [2] Limitation of external rotation [1] Case Procedure: Recurring instability [3] Erythema [1] Adhesive Capsulitis [2] Mild Restriction [1] Control Procedure: Recurring instability [16] Erythema [1] Adhesive Capsulitis [1] Mild Restriction [1] Other patients: Refractory stiffness
Robinson <i>et al.</i>	2008	Grade I	U.K.	2 years	Bankart lesion repair by arthroscopic technique [42]	Capsular arthroscopic lavage [42]	Control Procedure: Recurring instability [16] Erythema [1] Adhesive Capsulitis [1] Mild Restriction [1] Other patients: Refractory stiffness
Andrej Strahovnik e Samo K. Fokter	2006		Slovenia	9 years	Treatment of Bankart lesion by open technique. Single procedure [83]		Single procedure: Return of dislocation [5] Recurring subluxation [5] Stability Failure [10] Laxity without instability [5]
Jaeger <i>et al.</i>	2004		Germany	1 years and 8 months	T-plasty procedure and Bankart repair [31]	Anatomically oriented and modified anteroinferior capsular change procedure and Bankart repair [31]	Case Procedure: Return of subluxation [3] Dislocation [3] Control Procedure: Isolated Subluxation [1]
Buscayret <i>et al.</i>	2004		U.S.	6 years e 6 months	Coracoid transfer procedure [279]; Open soft tissue reconstruction [217]; Arthroscopic stabilization procedure [74].		At least one procedure performed: Arthritis with onset after surgery [104]
Jakobsen <i>et al.</i>	2007	Grade I	Denmark	10 years	Treatment of Bankart lesion by open technique [37]	Bankart lesion repair by arthroscopy [39]	Case Procedure: Recurring dislocation [3] Pain and stiffness [4] Need for surgical repair [1] Control Procedure: Recurring anterior dislocation [24] Subjective instability [1] Pain and stiffness [4]
Bottoni <i>et al.</i>	2002		U.S.	3 years	Non-surgical shoulder immobilization technique for 4 weeks followed by rehabilitation [14]	Bankart lesion repair by arthroscopy [10]	Control Procedure: Repair Failure [1] Loss of 4° in average external rotation in group [10]
Zamora-Navas <i>et al.</i>	2001		Belgium	13 years and 4 months	Boytchev technique. Single procedure [25]		Single procedure: Return of dislocation [5] Restriction of mobility [5]

out instability, 8 cases of pain and stiffness, 2 failures of surgical repair, 5 mobility restrictions, 2 mild restrictions, 10 instability failures, 3 complete dislocations and 1 isolated subluxation (**Table 2**).

4. Discussion

Despite the satisfactory clinical results of Latarjet procedure, the high prevalence of postoperative arthritis after the procedure is worrying. Recent research has shown a rate of development and progression to arthritis of about 23.5%.

The rate of postoperative arthritis after glenohumeral instability is around 35% - 71% in the long term. The risk for arthritis includes age of dislocation, time of surgery, and amount of pre-operative dislocations, intra-articular equipment, bone prominence and long-term follow-up [46] [47]. It is suggested that postoperative arthritis is caused not only by the Latarjet procedure but also by the natural history of glenohumeral joint. Recent evidence postulates that contact sports are associated with increased risk of developing arthritis over time, despite the low rate of recurrence. It is possible that these individuals suffer more micro-traumas on the articular surface when compared those who do not play sports [48]. In our review, 104 patients had arthritis in the postoperative period.

The surgical technique has great influence on the long-term development of arthritis. In the studies by Allain *et al.* and Singer *et al.*, 32 patients submitted to

Table 2. Surgical complications of anterior shoulder dislocation.

Complications	n
Infection	1
Return of instability	22
Return of dislocation	40
Limitation of external rotation	11
Erythema	2
Adhesive capsulitis	3
Mild restriction	2
Recurrent Subluxation	8
Stability failure	10
Laxity without instability	5
Complete dislocation	3
Isolated Subluxation	1
Arthritis	104
Pain and stiffness	8
Need for surgical repair	1
Repair failure	1
Mobility restriction	5

subscapular muscle tenotomy reported external rotation deficit associated with arthritis after coracoid grafting when long-term analyzed [46] [49].

Injury to shoulder cartilage is also commonly observed in association with subacromial impact and followed by rotator cuff repair. Magnetic resonance imaging after application of intra-articular contrast demonstrates moderate accuracy in the detection of cartilage lesions, such as the shoulder. Computed tomography appears as the best method for diagnosis of arthritis-associated cartilage lesions [50] [51] [52].

Septic arthritis, bursitis, periarticular soft tissue infection, and osteomyelitis represent rare complications of shoulder surgery. Conventional radiography is usually the only imaging method used to check for septic arthritis. Soft tissue edema, osteopenia, bone erosions and narrowing of articular space are radiographic signs in favor of infection. Magnetic resonance imaging shows value in the distinction between septic arthritis and synovial reaction, but it can be used in association with radiography for soft tissue infection, abscess formation and osteomyelitis [53] [54] [55].

A common complication of anterior shoulder dislocation is the recurrence of instability in about 60% of patients. Several biomechanical factors are involved in the return of this lesion; translation of humeral head into high positions is one example conferring recurrent instability [56] [57]. Studies comparing the recurrence of shoulder instability in surgical procedures with the open Latarjet technique and Bankart concluded that the recurrence of instability is about 5.9% and 23.2%, respectively. On the other hand, recurrence of instability in the Latarjet arthroscopy procedures was 3.4%. Latarjet arthroscopy seems to have better results in terms of prevention of recurrence and rehabilitation [58]. In our review, 22 patients presented recurring instability after surgical repair.

Common findings after rescreening of failed arthroscopies and open surgeries include uncured Bankart lesion, humeral avulsion of glenohumeral ligaments, extensive glenoid erosions, excessive capsular laxity, and reduction of humeral head retroversion or excessive retroversion of the glenoid cavity. Associated factors that may explain this high recurrence of instability following arthroscopy in our review include young patients, insufficient postoperative immobilization time, early return to contact sports, and multiple episodes of instability before immobilization [13].

Early surgical intervention reduces the risk of recurring dislocation by 6% to 23% [59] [60]. The differences in recurring dislocation rates between open and arthroscopic surgeries are significant. The risk of recurrence is double for arthroscopically-treated patients when compared to open surgery [61]. These results are surprising considering that technological advances in arthroscopic surgeries should bring clinical improvements and decrease of recurring dislocation rates.

Previous studies have shown that soft tissue loss and stretching of the musculotendinous unit are involved with the biomechanical alteration in the glenohumeral joint balance, which are risk factors for recurring subluxation [62]. In our

review, 9 patients had this complication.

Several studies have demonstrated loss of internal and external rotation after surgical procedure with Latarjet technique. The meta-analysis of An *et al.* evidenced movement restriction in both surgical repairs, Latarjet and Bankart, the latter implying about 6° of significant postoperative restriction [56]. Regarding open surgery, one of the explanations for reduction or loss of external and internal rotation includes excessive capsule thickening, cut or shortening of subscapularis tendon, and especially, the development of fibrosis in the reconstructed capsulolabral complex [38]. In our review, we identified 11 patients with external rotation limitation and 7 patients with motion restriction.

The limitations of this systematic review are directly related to the quality of selected studies and their inherent biases, as well as the absence by some studies of the citation of their level of evidence [38] [40] [41] [42] [43] [45] and the non-use of control group [40] [42] [43].

5. Conclusion

Establishing main complications of the surgical treatment of anterior shoulder dislocation remains a challenge and important area for future research. Studies are heterogeneous, not defining specific patterns to approach in the management of complications resulting from primary anterior shoulder dislocation. However, important information emerges: recurring instability, recurring dislocation, external rotation limitation, and arthritis are major surgical complications of anterior shoulder dislocation. Recurrence of instability appears as the main surgical complication of anterior shoulder dislocation, although the number of patients is lower when compared to those with arthritis.

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