International Orthopaedics (2019) 43:237–242
https://doi.org/10.1007/s00264-018-4195-1

ORIGINAL PAPER

Latarjet procedure versus open capsuloplasty in traumatic anterior shoulder dislocation: long-term clinical and functional results

Angelo De Carli[1] · Antonio Vadalà[1] · Lorenzo Proietti[1] · Antonio Ponzo[1] · Davide Desideri[1] · Andrea Ferretti[1]

Received: 27 April 2018 / Accepted: 2 October 2018 / Published online: 10 October 2018

Abstract

Purpose To compare the results of two different open surgical techniques (open capsuloplasty and Bristow-Latarjet procedure) at a mid- to long-term follow-up (6 years) in patients with recurrent traumatic anterior shoulder dislocations. Methods: Seventy-three patients (73 shoulders, 48 males; 25 females) fulfilled inclusion and exclusion criteria. Patients were classified as group A if operated on with a Bristow-Latarjet procedure (40 patients, 24 males; 16 females) or group B if operated on with an open capsuloplasty (33 patients, 24 males; 9 females). All patients were followed up with physical examination and functional evaluation scores (UCLA, ROWE and WOSI).

Results In group A, no further episodes of dislocation or subluxation were reported; in group B, one patient (3.3%) reported a new episode of anterior dislocation as a result of a new trauma. No statistical difference in regard of new episodes of shoulder dislocation was found between the two groups ($p > 0.05$). At physical examination, two patients (5%) of group A and four patients of group B (13.3%) showed a positive apprehension test ($p > 0.05$); anterior drawer test was positive in six patients (15%) of group A and in nine patients (30%) of group B ($p > 0.05$). Statistical analysis showed better external rotation in group A (Latarjet group) than in group B. ($p = 0.0176$). No statistical differences were detected in regard to the scale scores (UCLA, WOSI, Rowe) ($p > 0.05$). Regarding the return to sport, 29 patients (72.5%) of group A and 18 patients (60%) of group B reported they resumed the same sports activity at the same pre-operative level ($p > 0.05$).

Conclusion Open capsuloplasty and Bristow-Latarjet procedure are both validated surgical techniques for the treatment of recurrent shoulder anterior instability. We found no statistical difference in terms of recurrent dislocation rates, clinical shoulder stability tests, and scoring scales. The rate of patients returning to sport was similar after both techniques. However, patients with open capsuloplasty reported a significantly lower recovery of external rotation than patients operated via the Latarjet procedure.

Keywords Open capsuloplasty · Latarjet procedure · Pre-operative · Shoulder dislocation

Introduction

Traumatic anterior glenohumeral instability is a common condition leading to pain and functional restrictions. Shoulder dislocations represent 50% of all joint dislocations in the human body [1–4], with an incidence of 12 per 100,000/year [5]. In the last 20-years, many open and arthroscopic procedures have been described, both for acute and chronic instabilities [6–12]. The rate of recurrent anterior shoulder dislocation after surgery varies from 0 to 57% in the long term, and this can be due to inappropriate patient selection or unrecognised/underestimated pathological changes (such as bony Bankart lesions or large Hill-Sachs defects) [13, 14]. Many authors prefer as their first choice treatment an arthroscopic capsular shift [15]. Unfortunately, long-term follow-up studies in patients treated arthroscopically shows high recurrence rate [16]. Amongst the most common open surgical techniques with low recurrence rate, there are the Bristow-Latarjet procedure and the capsuloplasty. The Bristow-Latarjet procedure is a non-anatomical technique included in the family of "bone block procedures" and nowadays represents the "gold standard", especially when a bony Bankart is documented [17–20]. The open capsuloplasty technique is an anatomic procedure, which stabilises the shoulder through restoring anterior capsular insertion on the glenoid side. Some authors consider results of

✉ Lorenzo Proietti
proiettilorenzo@hotmail.com

[1] Azienda Ospedaliera Sant'Andrea, Via di Grottarossa, 1035/1039, 00189 Rome, Italy

open shoulder stabilizations more reliable than those of the arthroscopic technique, especially when performed in patients with recurrent instability and in professional athletes [21–23].

The aim of the present study is to compare the results of two different open surgical techniques (open capsuloplasty and Bristow-Latarjet procedure) at a mid- to long-term follow-up in patients with recurrent traumatic anterior shoulder dislocations.

Materials and methods

Patients with the following inclusion criteria were retrospectively evaluated: recurrent anterior shoulder dislocation, inclusion in sports activities even if not as professional, minimum follow-up of six years (range 6–9 years), preoperative MRI showing absence of glenoid bone loss and a number of dislocation between a minimum of two and a maximum of ten episodes in order to exclude patients with high numbers of pre-operative recurrences. Exclusion criteria were first episode, multidirectional instability, voluntary dislocation and previous surgery on the affected shoulder; pre-operative signs of glenohumeral osteoarthritis, association of rotator cuff tears or SLAP lesions; concomitant systemic disease, such as lupus or rheumatoid arthritis. Seventy-three patients (73 shoulders, 48 males; 25 females) fulfilled these criteria and were followed up with physical examination and functional evaluation scores (UCLA, ROWE and WOSI).

The two groups were homogeneous for age, sex, BMI, number of dislocations, time from first episode to surgery and sport activity level.

Mean age at surgery time was 28 years (range 16–41); mean number of pre-operative shoulder dislocations were four (range 2–10). Patients were classified as group A if operated on with a Bristow-Latarjet procedure (40 patients, 24 males; 16 females) or group B if operated on with an open capsuloplasty (33 patients, 24 males; 9 females).

For both techniques, the patient was placed in the beach chair position and a deltopectoral approach was used. Both techniques were carried out with a vertical tenotomy of the subscapularis tendon. The Latarjet procedure as described by Walsh [24] was performed by reattaching the coracoid process with two 4.0-mm Asnis screws (Stryker, Michigan, USA) on the anterior glenoid neck [Figs. 1 and 2]. The open capsuloplasty was performed as described by Ferretti et al. [25]. The conjoined tendons were retracted medially, and the superficial layer of the subscapularis tendon was divided transversely near its insertion and raised medially, leaving the deep portion of the tendon continuous with the shoulder capsule. With the shoulder in neutral position, the capsule was opened approximately 1 cm lateral to the glenoid rim. The Bankart lesion was identified and osseous attachment points were determined. The bony surface was decorticated and holes were drilled at the edge of the articular cartilage. Three non-absorbable anchors were used (3.7-mm Tag Suture anchor, Smith & Nephew, London, UK, or 2.8-mm FastTak anchor, Arthrex, Naples, USA) between the 2- and 5 o'clock positions for a right shoulder [Figs. 3 and 4]. The suture was pulled firmly to test the stability of the suture anchor. The pre-attached nonabsorbable suture was passed through the residual labrum and medial flap of the capsule and tied firmly, bringing the capsule into contact with the bone. The capsule was closed and the subscapularis muscle was repaired anatomically.

Post-operatively, gentle pendulum exercises and passive exercises up to 90° in flexion and abduction in the supine position were allowed two weeks post-operatively in both groups. A sling brace was applied for four weeks, after which, stretching exercises in all planes and light activities of daily living were allowed. At eight post-operative weeks, strengthening exercises for the deltoid, rotator cuff muscles and scapula-stabilising muscles were started. Full return to sports activities was never allowed before six months after surgery.

The Student *t* test and chi-square test (Pearson's test) were used to analyse the data for the patients in this series. To evaluate the primary study outcomes (i.e., laxity scores and subjective score for patient satisfaction), the power to detect a difference between groups was determined as follows: for UCLA score, 1-beta was not statistical significance (95% confidence interval 31.67; 33.13); for Rowe score, more than 90, 1-beta was 0.43 (95% confidence interval 94.23; 96.34). Alpha was considered 5% for all power analysis. Statistical analyses were performed using R (GNU GPL for Microsoft Windows; version 3.1.0).

Results

Three patients were not available for follow-up. As a consequence, 70 patients were followed up at a minimum of six years (mean 6–9 years): 40 patients of group A (Latarjet procedure) and 30 patients of group B (capsular repair). In group A, no further episodes of dislocation or subluxation were reported; in group B, one patient (3.3%) reported a new episode of anterior dislocation as a result of a new trauma: in this patient, a revision with a Latarjet procedure was performed. No statistical difference in regard of new episodes of shoulder dislocation was found between the two groups ($p > 0.05$). At physical examination, two patients (5%) of group A and four patients of group B (13.3%) showed a positive apprehension test ($p > 0.05$); anterior drawer test was positive in six patients (15%) of group A and in nine patients (30%) of group B ($p > 0.05$). In all cases, these findings did not correlate to subjective feeling of shoulder instability reported by patients.

Recovery of abduction and flexion was complete in all patients of both groups. In external-rotation (ER), an overall

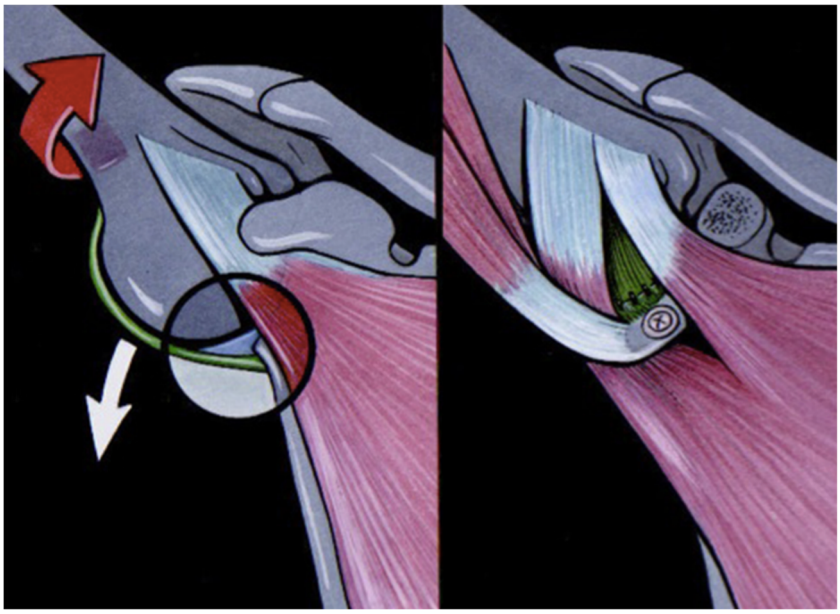

Fig. 1 Demonstration of the triple-blocking effect as described by Patte. [Patte D, Debeyre J. Luxations recidivantes de l'e ́paule. Encycl Med Chir Paris-Technique chirurgicale Orthope ́die 1980;44,265:44–52]

mean decrease of 4.1° (3 to 12°) was recorded in group A (side-to-side evaluation: S/S). However, in 34 patients (85%), the ER decrease was lower than 10°. In group B, overall loss of ER was 9.7 (7 to 14°) with 18 patients (60%) reporting a decrease lower than 10°. Statistical analysis showed better external rotation in group A (Latarjet group) than in group B. ($p = 0.0176$) **(**Table 1**)**.

Functional evaluation scales showed satisfactory results in all the scoring scales used: mean UCLA score was 32.3 in group A and 32.5 in group B; mean Rowe score was 95.6 in group A and 94.8 in group B; mean WOSI score was 111 in group A and 102 in group B. No statistical differences were detected in regard to the scale scores ($p > 0.05$) **(**Table 2**)**.

Regarding the return to sport, 29 patients (72.5%) of group A and 18 patients (60%) of group B reported they resumed the same sports activity at the same pre-operative level ($p > 0.05$). In all other cases, patients changed sports activity or gave up sports because they worried about further shoulder problems. In group A, seven patients (17.5%) changed sports activity and four patients (10%) gave up sports activity, while in group B, six patients (20%) changed sports activity and six patients (20%) gave up sports activity [Fig. 5].

Discussion

Although several open and arthroscopic techniques have been proposed to treat anterior shoulder instability, open surgical techniques such as Bristow-Latarjet and capsuloplasty continue to play an important role in the management of recurrent shoulder instability. In the last 20 years, arthroscopic techniques have certainly contributed to the progressive reduction of open capsuloplasties because of the believe that arthroscopic procedures would have provided the same excellent results as the open technique (since in both techniques, the steps aim at reinserting the detached capsulae to the anterior glenoid

Fig. 2 Post-operative radiographs showing satisfactory screw and graft position

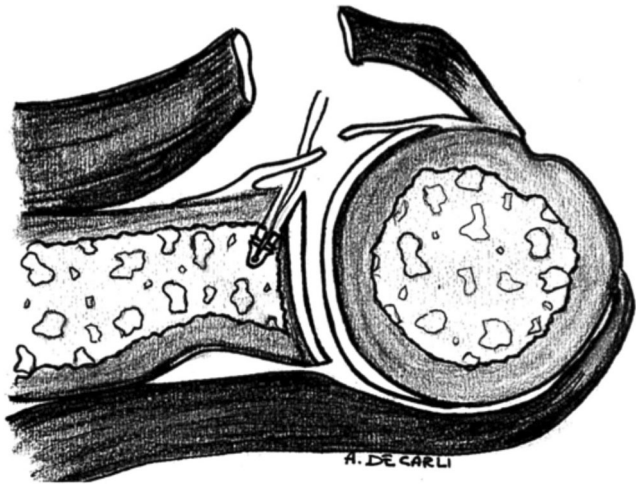

Fig. 3 Coronal view of the shoulder with suture anchor positioned in the anterior glenoid rim and suture passing through the residual labrum of the capsule

neck). However, despite satisfactory results in short-term follow-up and improved results obtained over time [25, 26], long-term analysis of arthroscopic procedures tends to show less satisfactory results when compared to open techniques, or mini invasive techniques [27], especially in patients with reported tens of episodes of dislocation, in heavy workers or in contact sports professionals [28–31].

Fig. 4 Post-operative radiographs showing suture anchor positioned at the edge of the articular cartilage

Table 1 Clinical results

	New dislocation	Positive apprehension test	Positive anterior drawer test	External rotation decrease
Group A	0	2 (5%)	6 (15%)	4.1° (3 to 12°)
Group B	1(3.3%)	4 (13.3%)	9 (30%)	9.7° (7 to 14°)
	$p > 0.05$	$p > 0.05$	$p > 0.05$	$p = 0.0176$

Recently, some authors, e.g., Mohtadi et al. [32] reported a significantly greater failure rate with arthroscopic instability repair compared with open repair in a prospective, expertise-based and randomised clinical trial; furthermore, the authors have shown how complex instability patterns, revision of previous stabilisation attempts and collision athletes should all be considered for open instability repair.

Among the open surgical options, the Latarjet procedure has lately become the most commonly performed technique because of its highly satisfactory percentage of clinical and functional results. However, open capsuloplasty still represents a valid option, especially in cases of lack or small percentage of glenoid bone loss. Because of the higher awareness of the satisfactory results of both these open techniques, we decided to follow-up patients operated on with Latarjet or open capsuloplasty, with the aim to assess the validity of each technique and to detect subjective and objective clinical and functional results. The mid- to long-term results of this study (minimum follow-up of 6 years) show how both these techniques provide excellent results in terms of recurrence of dislocation (one case in the open capsuloplasty and no case in the Latarjet group), with no significant differences. Similarly, return to sports activities was similar in both groups, with more than two thirds of patients returning to the pre-operative sport level (72.5% in group A and 60% in group B; $p > 0.05$); furthermore, the scoring scales used showed no difference amongst the two techniques, thus suggesting satisfactory subjective and objective results in terms of stability of the operated shoulder.

Recovery of external rotation was the only data found to be statistically different among the two techniques, with better results in the Latarjet group (mean decrease 4.1° in group A and 9.7° in group B; $p = 0.0176$); however, this data seemed to have influenced the return to sport in none of the patients assessed. Nevertheless, this data might have influenced the

Table 2 Functional evaluation scales score

	UCLA	WOSI	ROWE
Group A	32.3	111	95.6
Group B	32.5	102	94.8
	$p > 0.05$	$p > 0.05$	$p > 0.05$

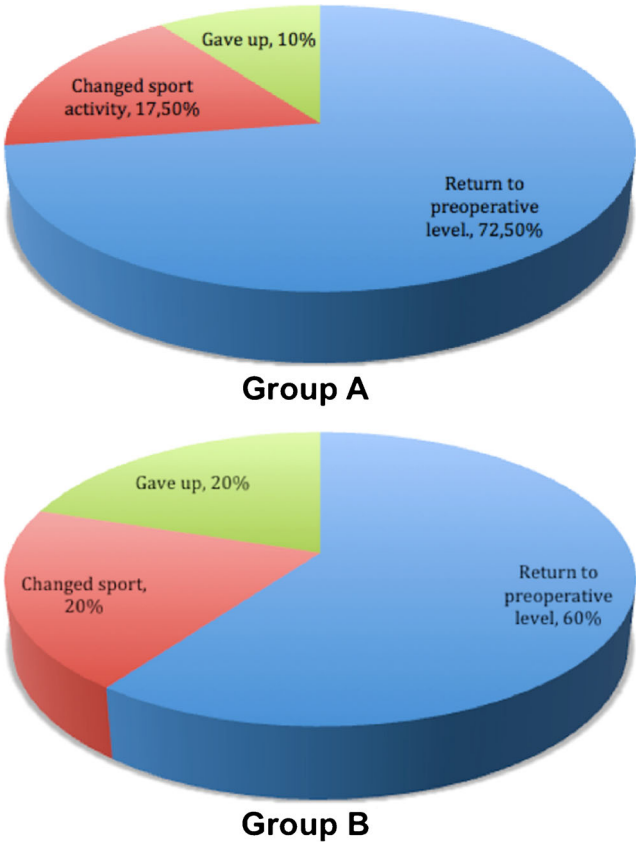

Fig. 5 Return to pre-operative level, 29 patients (72.5%) of group A and 18 patients (60%) of group B. About sport recovery, statistical analysis showed no significant difference between the two groups ($p > 0.05$)

final results in cases in which patients were performing particular types of sports (such as baseball), where a complete recovery of the external rotation is mandatory.

We also detected, by examining charts of patients before the final follow-up, the tendency of a faster recovery of motion ranges in patients operated on with the Latarjet procedure in all the planes examined; however, even in this case, the final results of overall motion range were similar in both groups, with the only exception of the external rotation.

The Latarjet procedure seems to be the technique of choice in cases in which patients require a faster post-operative rehabilitation protocol (e.g., because of work necessities) or in which a complete recovery of external rotation is needed. On the other side, we also need to consider that open capsuloplasty is a more anatomic procedure compared to the Latarjet technique. This is an important advantage because, in case of revision, it is possible to perform a Latarjet procedure after a capsuloplasty, while the contrary is not possible (as reported in the patients of group B of this study, whose open capsuloplasty was revised via the Latarjet procedure). Meanwhile, in case of Latarjet failure, revision surgery consisted of a structural iliac crest bone graft in the majority of cases like an Eden-Hybbinette procedure [33, 34]. In accordance with literature [27], the Eden-Hybinette technique seems to be more appropriate for revision surgery and for patients with a failed Latarjet procedure.

Even when considering male patients or female patients, the scoring scale results did not show differences in terms of subjective and objective results. Similarly, no significant differences were detected when considering patients with different numbers of pre-operative dislocations. This data might be interesting especially when considering patients of group B (capsuloplasty), where some doubts might arise at the idea of re-attaching a capsuloligamentous structure that has been offended so many times before its reinsertion. The results of this study show that both open capsuloplasty and Latarjet are effective even in patients with long-term follow-up.

We recognise several limitations of our study. First, this is a retrospective study and as such, it is prone to selection bias; however, we believe that the findings are important and relevant. The patients reviewed were relatively young and active, so our results may not be applicable to the entire population. In this study, we evaluated patients with only three clinical scales, namely Rowe, WOSI and UCLA. Moreover six years follow-up is a short follow-up for arthritis development. The strengths of this study include uniformity in pre-operative evaluation, operative technique and post-operative care.

Conclusion

Open capsuloplasty and Bristow-Latarjet procedures are both validated surgical techniques for the treatment of recurrent shoulder anterior instability. We found no statistical difference in terms of recurrent dislocation rates, clinical shoulder stability tests and scoring scales. The rate of patients returning to sport was similar after both techniques. Patients with open capsuloplasty reported a significantly lower recovery of external rotation than patients operated on via the Latarjet procedure.

Open capsuloplasty seems to provide similar results in the mid- to long-term follow-up compared to the Latarjet procedure in terms of evaluation scales and recurrence rate.

We believe that it might represent a valid option even in patients involved in sports activities. Moreover, it can be easily revised with a Latarjet in case of failure. On the other side, the Latarjet technique remains the gold standard in patients who require a faster rehabilitative protocol or in cases in which a quick recovery of external rotation is necessary.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

References

1. Zacchilli MA, Owens BD (2010) Epidemiology of shoulder dislocations presenting to emergency departments in the United States. J Bone Joint Surg Am 92:542
2. Simon RR, Sherman SC, Koenigsknecht SJ (2006) Emergency orthopedics: the extremities, 5th. McGraw-Hill, New York
3. Schaider J, Simon RR (2005) Shoulder injuries. In: Wolfson AB, Hendey GW, Hendry PL et al (eds) Clinical practice of emergency medicine. Lippincott Williams & Wilkins, Philadelphia, p 1033
4. Sineff SS, Reichman EF (2004) Shoulder joint dislocation reduction. In: Reichman EF, Simon RR (eds) Emergency medicine procedures. McGraw-Hill, New York, p 593
5. Simonet WT, Melton LJ 3rd, Cofield RH, Ilstrup DM (1984) Incidence of anterior shoulder dislocation in Olmsted County, Minnesota. Clin Orthop Relat Res 186:186–191
6. Rokito AS, Namkoong S, Zuckerman JD, Gallagher MA (1998) Open surgical treatment of anterior glenohumeral instability: an historical perspective and review of the literature. Part I. Am J Orthop (Belle Mead NJ) 27(11):723–725 Review
7. Rokito AS, Namkoong S, Zuckerman JD, Gallagher MA (1998) Open surgical treatment of anterior glenohumeral instability: an historical perspective and review of the literature. Part II. Am J Orthop (Belle Mead NJ) 27(12):784–790 Review
8. Boselli KJ, Cody EA, Bigliani LU (2010) Open capsular shift: there still is a role! Orthop Clin North Am 41(3):427–436
9. Gill TJ, Zarins B (2003) Open repairs for the treatment of anterior shoulder instability. Am J Sports Med 31(1):142–153
10. Ticker JB, Warner JJ (2000) Selective capsular shift technique for anterior and anterior-inferior glenohumeral instability. Clin Sports Med 19(1):1–17
11. Larrain MV, Montenegro HJ, Mauas DM, Collazo CC, Pavón F (2006) Arthroscopic management of traumatic anterior shoulder instability in collision athletes: analysis of 204 cases with a 4- to 9-year follow-up and results with the suture anchor technique. Arthroscopy 22(12):1283–1289
12. Miniaci A, Codsi MJ (2006) Thermal capsulorrhaphy for the treatment of shoulder instability. Am J Sports Med 34(8):1356–1363
13. Boileau P, Fourati E, Bicknell R (2012) Neer modiation of open Bankart procedure: what are the rates of recurrent instability, functional outcome, and arthritis? Clin Orthop Relat Res 470:2554–2560
14. Tjoumakaris FP, Abboud JA, Hasan SA, Ramsey ML, Williams GR (2006) Arthroscopic and open Bankart repairs provide similar outcomes. Clin Orthop Relat Res 446:227–232
15. Zimmermann SM, Scheyerer MJ, Farshad M, Catanzaro S, Rahm S, Gerber C (2016) Long-term restoration of anterior shoulder stability: a retrospective analysis of arthroscopic Bankart repair versus open Latarjet procedure. J Bone Joint Surg Am 98(23):1954–1961
16. Hobby J, Griffin D, Dunbar M, Boileau P (2007) Is arthroscopic surgery for stabilisation of chronic shoulder instability as effective as open surgery? A systematic review and meta-analysis of 62 studies including 3044 arthroscopic operations. J Bone Joint Surg Br 89(9):1188–1196
17. Matthes G, Horvath V, Seifert J et al (2007) Oldie but goldie: Bristow-latarjet procedure for anterior shoulder instability. J Orthop Surg (Hong Kong) 15(1):4–8
18. Latarjet M (1954) Treatment of recurrent dislocation of the shoulder. Lyon Chir 49:994–997
19. ElAttrache NS (2007) Surgical techniques in sports medicine. Lippincott Williams & Wilkins:177–187
20. Murena L, Guindani N, Turino S, Grassi FA, Cherubino P (2016) Long-term outcome of Rockwood capsular shift for recurrent shoulder dislocation. J Orthop Surg 24(3):392–397
21. Cheung EV, Sperling JW, Hattrup SJ et al (2008) Long-term outcome of anterior stabilization of the shoulder. J Shoulder Elb Surg 17:265
22. Meller R, Krettek C, Gosling T et al (2007) Recurrent shoulder instability among athletes: changes in quality of life, sports activity, and muscle function following open repair. Knee Surg Sports Traumatol Arthrosc 15:295
23. Bigliani LU, Kurzweil PR, Schwartzbach CC et al (1994) Inferior capsular shift procedure for anterior-inferior shoulder instability in athletes. Am J Sports Med 22:578
24. Joshi MA, Young AA, Balestro JC, Walch G (2015) The Latarjet-Patte procedure for recurrent anterior shoulder instability in contact athletes. Orthop Clin North Am 46(1):105–111. https://doi.org/10.1016/j.ocl.2014.09.005
25. Kordasiewicz B, Małachowski K, Kicinski M, Chaberek S, Pomianowski S (2017 May) Comparative study of open and arthroscopic coracoid transfer for shoulder anterior instability (Latarjet)-clinical results at short term follow-up. Int Orthop 41(5):1023–1033. https://doi.org/10.1007/s00264-016-3372-3
26. Kordasiewicz B, Kicinski M, Małachowski K, Wieczorek J, Chaberek S, Pomianowski S (2018) Comparative study of open and arthroscopic coracoid transfer for shoulder anterior instability (Latarjet)-computed tomography evaluation at a short term follow-up. Part II Int Orthop 42(5):1119–1128. https://doi.org/10.1007/s00264-017-3739-0
27. Lateur G, Pailhe R, Refaie R, Chedal Bornu BJ, Boudissa M, Saragaglia D (2018) Results of the Latarjet coracoid bone block procedure performed by mini invasive approach. Int Orthop 42(10):2397–2402. https://doi.org/10.1007/s00264-018-3914-y
28. Ferretti A, De Carli A, Calderaro M, Conteduca F (1998) Open capsulorrhaphy with suture anchors for recurrent anterior dislocation of the shoulder. Am J Sports Med 26(5):625–629
29. Lenters TR, Franta AK, Wolf FM, Leopold SS, Matsen FA 3rd. (2007) Arthroscopic compared with open repairs for recurrent anterior shoulder instability. A systematic review and meta-analysis of the literature. J Bone Joint Surg Am 89:244–254
30. Millett PJ, Clavert P, Warner JJ (2005) Open operative treatment for anterior shoulder instability: when and why? J Bone Joint Surg Am 87:419–432
31. Mohtadi NG, Bitar IJ, Sasyniuk TM, Hollinshead RM, Harper WP (2005) Arthroscopic versus open repair for traumatic anterior shoulder instability: a meta-analysis. Arthroscopy 21:652–658
32. Mohtadi NG, Chan DS, Hollinshead RM et al (2014) A randomized clinical trial comparing open and arthroscopic stabilization for recurrent traumatic anterior shoulder instability: two-year follow-up with disease-specific quality-of-life outcomes. J Bone Joint Surg Am 96:353–360
33. Willemot L, De Boey S, Van Tongel A, Declercq G, De Wilde L, Verborgt O (2018) Analysis of failures after the Bristow-Latarjet procedure for recurrent shoulder instability. Int Orthop. https://doi.org/10.1007/s00264-018-4105-6
34. Villatte G, Spurr S, Broden C, Martins A, Emery R, Reilly P (2018) The Eden-Hybbinette procedure is one hundred years old! A historical view of the concept and its evolutions. Int Orthop. https://doi.org/10.1007/s00264-018-3970-3