Operative Treatment of Anterior Shoulder Instability

A Network Meta-Analysis

Eoghan T. Hurley, MB, BCh, MCh, Utkarsh Anil, MD, Daren Lim Fat, MCh, FEBOT, Leo Pauzenberger, MD, Eric J. Strauss, MD, and Hannan Mullett, MCh, FRCSI (Tr& Orth)

Abstract

Background: Traumatic anterior shoulder instability is a common clinical problem among athletic populations, with several surgical treatment options available. The optimal treatment remains undetermined. Currently the main current treatment options are the Latarjet procedure or open or arthroscopic Bankart repair. The purpose of this study was to network meta-analyze the recent evidence to ascertain if the open Latarjet procedure and open or arthroscopic Bankart repair result in lower recurrence rates and subsequent revision procedures. The results were ranked with the P-score.

Methods: A literature search was performed based on the PRISMA guidelines. Cohort studies comparing any of the open Latarjet procedure and open or arthrosopic Bankart repair for anterior shoulder instability were included. Clinical outcomes were compared using a frequentist approach to network meta-analysis, with statistical analysis performed using R.

Results: Twenty-nine studies with 2,474 patients were included. The open Latarjet procedure resulted in lower rates of recurrent instability and revisions due to recurrence compared to both open and arthroscopic Bankart repairs. The open Latarjet procedure resulted in the highest rate of return to play. However, the open Latarjet procedure also resulted in the highest complication rate.

Conclusion: Our network meta-analysis found the open Latarjet procedure had the lowest recurrence rates, lowest revisions rates, and highest rates of return to play in the surgical treatment of anterior shoulder instability. However, the Latarjet procedure has been shown to result in a higher complication rate, which needs to be considered when deciding which stabilization procedure to perform.

Traumatic anterior shoulder instability is a challenging clinical problem particularly among collision athletes, with a recent study among professional rugby players showing an incidence of 21%.[1,2] Many surgical techniques have been described to address symptomatic anterior shoulder instability. The arthroscopic Bankart repair is the most commonly performed procedure for shoulder instability globally in the setting of soft tissue injury absent of glenoid bone loss.[3-5] Additionally, a posterior capsulodesis, widely known as a remplissage procedure, is performed to augment anterior soft tissue repairs in the setting of humeral bone loss (Hill Sachs lesion).[6] The open Bankart procedure may allow for improved management of capsular deficiency and may be more cost-effective. Although widely performed and generally considered successful, concern exists over the high rate of recurrence following soft tissue repair alone, with rates of up to 30% to 40% reported in studies at 10-year follow-up.[7,8]

The Latarjet procedure is an alternative treatment, favored primarily in Europe, involving transferring part of the coracoid process and the attached conjoint tendon to the anterior aspect of the glenoid rim to restore stability. Lower recurrence rates have been reported following the Latarjet procedure, but significant complications such as nonunion, hardware problems, and neurovascular injuries have been described.[9-12] While traditionally performed in open fashion, the Latarjet procedure can be performed arthroscopically, whereas the current evidence on this approach is limited albeit promising.

Eoghan T. Hurley, MB, BCh, MCh, National Department of Surgery, University of Ireland Galway, Galway, Ireland. Daren Lim Fat, MCh, FEBOT, Leo Pauzenberger, MD, and Hannan Mullett, MCh, FRCSI, Sports Surgery Clinic, Dublin, Ireland. Utkarsh Anil, MD, and Eric J. Strauss, MD, Department of Orthopedic Surgery, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, New York, USA.

Correspondence: Eoghan T. Hurley, MB, BCh, MCh, Sports Surgery Clinic, Northwood Avenue, Santry, Santry Demesne, Dublin 9, Ireland; eoghanhurley@rcsi.ie.

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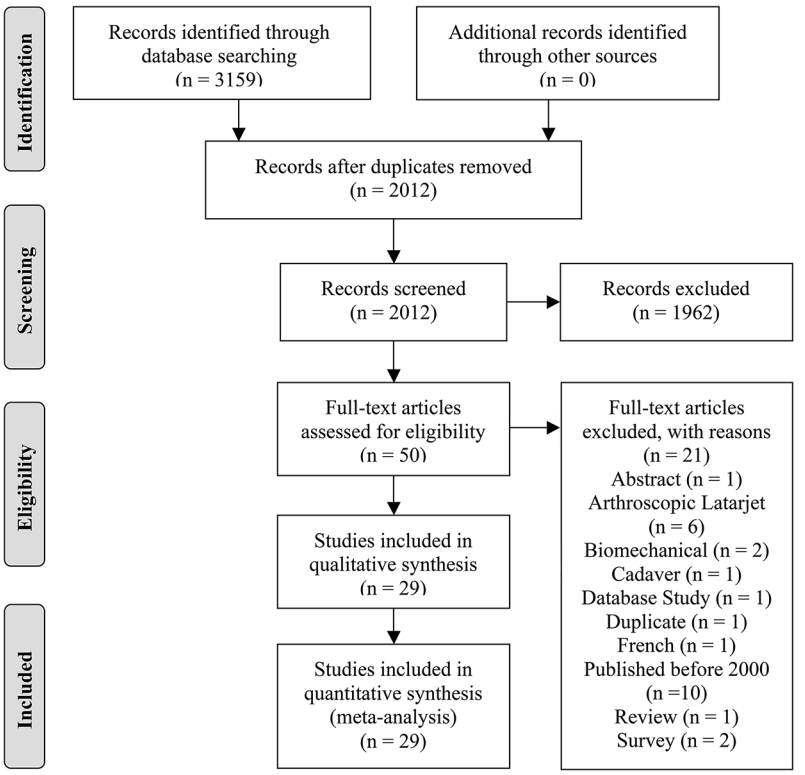

Figure 1 PRISMA study selection flow diagram.

There is currently no consensus as to the optimal surgical treatment of symptomatic anterior shoulder instability in the active patient population despite the increasing volume of stabilization procedures being performed.[3] Therefore, the purpose of this study was to network meta-analyze the recent evidence in the literature to ascertain if the open Latarjet procedure and open or arthroscopic Bankart repair result in lower recurrence and subsequent revision rates. Our hypothesis was that the open Latarjet procedure would result in the lowest recurrence rates of the surgical treatment approaches.

Methods

Study Selection

Two independent reviewers performed a literature search based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and reviewed the search results, with a third author arbitrating in the event of a disagreement.[13] The title and abstract were reviewed for all search results and potentially eligible studies received a full-text review. In addition, the reference lists of all included studies and all literature reviews found in the search results were manually screened for additional articles that met the inclusion criteria.

Search Strategy

The following search terms were used in MEDLINE, EMBASE, and The Cochrane Library databases on August 20, 2018, as the search algorithm: (shoulder instability OR anterior shoulder instability) AND (Latarjet OR Latarjet procedure OR Bristow OR Bristow procedure OR Bristow-Latarjet OR Bankart OR Bankart repair OR stabilization or remplissage). Only studies published after January 1, 2000, were considered for inclusion, as recent studies have found improved recurrence rates with modern techniques.[14]

Eligibility Criteria

The inclusion criteria were the following: 1. clinical studies comparing any of the two following two treatments; arthroscopic Bankart repair (AB), open Bankart repair (OB), and open Latarjet procedure (OL); 2. published in a peer reviewed journal; 3. published in English; and 4. a full text of the study must be available. The exclusion criteria were the following: 1. case series, 2. review articles, 3. database study, 4. cadaver studies, 5. biomechanical studies, and 6. those in which only an abstract was available.

Data Extraction and Analysis

All relevant information regarding the study characteristics including design, level of evidence, methodological quality of evidence, population, outcome measures, and follow-up time points were collected by two independent reviewers using a predetermined data sheet. When required information was not available in the articles, the authors were contacted. The methodological quality of the evidence (MQOE) was assessed using the Newcastle-Ottawa scale,[15] a 9-point scale where studies with 7 to 9, 5 to 6, 4, and 0 to 3 points were identified as very good, good, satisfactory, and unsatisfactory, respectively.

Table 1 Study Characteristics

Study	LOE	Design	MQOE	N		Follow-up
Arthroscopic Bankart Versus Open Bankart				AB	OB	
Bottoni et al. 2006[21]	I	RCT	9	32	29	29
Cole et al. 2000[22]	II	PCS	8	37	22	53
Fabbriciani et al. 2004[23]	I	RCT	9	30	30	24
Hubbell et al. 2004[24]	III	RCS	8	30	20	68
Karlsson et al. 2001[25]	II	PCS	8	60	48	32
Kim et al. 2002[26]	III	RCS	9	58	30	39
Lutzner et al. 2009[27]	III	RCS	8	40	159	31
Mahirogullari 2010[28]	III	RCS	9	34	30	26
Mohtadi et al. 2014[29]	I	RCT	8	98	98	24
Netto et al. 2012[30]	II	RCT	8	17	25	37.5
Owens et al. 2017[31]	II	RCT	8	9	10	24
Rhee et al. 2006[32]	III	RCS	8	16	32	72
Sperber et al. 2011[33]	I	RCT	9	30	26	24
Sperling et al. 2005[34]	III	RCS	7	5	6	68
Tjoumarkis et al. 2006[35]	III	RCS	8	49	24	42
Uchiyama et al. 2017[36]	II	PCS	8	15	17	63
Virk et al. 2017[37]	III	RCS	9	58	24	39
Wang et al. 2005[38]	III	RCS	6	20	22	24
Zaffagnini et al. 2012[39]	III	RCS	7	49	33	174
Arthroscopic Bankart Versus Open Latarjet				AB	OL	
Bessiere et al. 2014[40]	III	RCS	9	93	93	72
Blonna et al. 2016[41]	III	CCS	8	30	30	64
Cho et al. 2016[42]	III	CCS	8	37	35	27
Russo et al. 2016[43]	III	RCS	8	20	20	21
Zarezade et al. 2014[44]	II	PCS	7	18	19	N/R
Zimmermann et al. 2016[8]	III	RCS	7	271	93	139
Open Bankart Versus Open Latarjet				OB	OL	
Aydin et al. 2012[45]	III	RCS	6	25	13	66
Hovelius et al. 2001[46]	III	RCS	9	26	30	195
Hovelius et al. 2011[47]	III	CCS	9	88	97	204
Mahirogullari et al. 2006[48]	III	RCS	6	34	30	27

AB. arthroscopic Bankart; CCS, case-control study; LOE, level of evidence; MQOE, methodological quality of evidence; N, number; N/D, not reported; OB, open Bankart; OL, open Latarjet; PCS, prospective cohort study; RCS, retrospective cohort study; RCT, randomized control trial.

Outcomes Measured

The outcomes measured focused on the following factors: 1. stability: total recurrence (including recurrent dislocations and subluxations), and recurrent dislocations; 2. revisions: total revisions, and revisions due to recurrent instability; 3. functional outcomes: Rowe score, and return to play; and 4. total complications.

Statistics

All statistical analyses were performed using R (R Foundation for Statistical Computing, Vienna, Austria). A frequentist approach to network meta-analysis with a random effects model was performed using the netmeta package version 0.9-6 in R.[16] Where the standard deviation was not reported, the methods by Hozo et al.[17] were used to calculate

it. Heterogeneity was quantified using the I^2 statistic.[18] To rank the treatments, we used the frequentist analog to the surface under the cumulative ranking (SUCRA) probabilities called the P-score.[19,20] Studies were ranked according to their P-score.

Results

Literature Search

The initial literature search resulted in 3,159 total studies. Once duplicates were removed and the articles were screened for inclusion and exclusion criteria, 2,012 studies were included and the full text of the articles were assessed for eligibility. Twenty-nine studies with 2,474 patients were included in this review (Fig. 1).

Study Characteristics

There were 29 studies included that compared 687 patients with AB to 685 patients with OB (19 studies), 469 patients with AB to 290 patients with OL (six studies), and 173 patients with OB to 170 patients with OL (four studies).[8,21-48] There were six randomized control trials, four prospective cohort studies, three case control studies, and 16 retrospective cohort studies. The mean MQOE was 8. The mean follow-up was 75.4 months. The study characteristics. are shown in Table 1.

Clinical Outcomes

Total Recurrent Instability

Total recurrent instability was reported in 24 studies. The OL procedure resulted in statistically significantly lower rates of recurrent instability compared to OB (OR: 2.04; 95% CI: 1.17 to 3.55; p = 0.010) and AB (OR: 3.41; 95% CI: 2.02 to 5.76; p < 0.001). There was a statistically significant difference in favor of OB over AB (OR: 1.67; 95% CI: 1.13 to 2.47; p = 0.001). Based on these findings, the OL procedure was the treatment with the highest P-score, 0.9971. There was low heterogeneity between the studies (I^2 =16.1%, p = 0.242).

Recurrent Dislocations

The incidence of recurrent dislocations was reported in 20 studies. The OL procedure resulted in statistically significantly lower rates of recurrent dislocations compared to AB (OR: 2.90; 95% CI: 1.41 to 5.96; p = 0.004) but not OB (OR: 1.82; 95% CI: 0.85 to 3.90; p = 0.125). There was no statistically significant difference between OB and AB (OR: 1.59; 95% CI: 0.99 to 2.57; p = 0.056). Based on these findings the OL procedure was the treatment with the highest P-score, 0.9679. There was low heterogeneity between the studies (I^2 =7.6%, p = 0.363).

Total Revisions

The rate of revision procedures was reported in 18 studies. The OL procedure resulted in statistically significantly lower rates of revisions compared to AB (OR: 2.42; 95% CI: 1.33 to 4.40; p = 0.004) but not OB (OR: 1.67; 95% CI: 0.86 to 3.24; p = 0.129). There was no statistically significant difference between OB and AB (OR: 1.45; 95% CI: 0.88 to 2.38; p = 0.150). Based on these findings the OL procedure was the treatment with the highest P-score, 0.9668. There was low heterogeneity between the studies (I^2 =3.7%, p = 0.411).

Revisions Due to Recurrence

Revisions due to recurrence were reported in 18 studies. The OL procedure resulted in statistically significantly lower rates of revisions due to recurrence compared to OB (OR: 3.22; 95% CI: 1.28 to 8.09; p = 0.013) and AB (OR: 6.06; 95% CI: 2.50 to 14.69; p < 0.001). There was a statistically significant difference in favor of OB over AB (OR: 1.88; 95% CI: 1.09 to 3.25; p = 0.023). Based on these findings the OL procedure was the treatment with the highest P-score, 0.9967. There was low heterogeneity between the studies (I^2 =0%, p = 0.628).

Rowe Score

The Rowe score was reported in 13 studies. The OL procedure resulted in similar Rowe scores compared to OB (OR: -1.11; 95% CI: -5.90 to 3.69; p = 0.651) and AB (OR: 1.23; 95% CI: -2.21 to 4.66; p = 0.438). There was no statistically significant difference between OB and AB (OR: -2.34; 95% CI: -8.23 to 3.56; p = 0.484). Based on these findings the OL procedure was the treatment with the highest P-score, 0.7278. There was significant heterogeneity between the studies (I^2 =83.1%, p < 0.001).

Return to Play

Return to play was reported in 10 studies. The OL procedure resulted in statistically significantly higher rates of return to play compared to AB (OR: 0.62; 95% CI: 0.42 to 0.91; p = 0.016) but not OB (OR: 0.71; 95% CI: 0.44 to 1.15; p = 0.162). There was no statistically significant difference between OB and AB (OR: 0.87; 95% CI: 0.51 to 1.50; p = 0.615). Based on these findings OL was the treatment with the highest P-score, 0.9554. There was low heterogeneity between the studies (I^2 =0%, p = 0.775).

Total Complications

Complication rates were reported in 15 studies. The OL procedure resulted in statistically significantly higher rates complications compared to AB (OR: 0.62; 95% CI: 0.29 to 1.31; p = 0.011) but not OB (OR: 0.36; 95% CI: 0.12 to 1.06; p = 0.065). There was no statistically significant difference between OB and AB (OR: 0.62; 95% CI: 0.29 to 1.31; p = 0.208). Based on these findings AB was the treatment with the highest P-score, 0.9453. There was low heterogeneity between the studies (I^2 =0%, p = 0.804).

The P-scores and the raw percentages for clinical outcomes are shown in Tables 2 and 3. It should be noted that the reported percentages of clinical outcomes are not reflective

Table 2 P Scores

Recurrent Instability	Recurrent Dislocations	Revisions	Revisions Due to Recurrence	Rowe Score	Return to Play	Total Complications
OL: 0.9971	OL: 0.9679	OL: 0.9668	OL: 0.9967	OL: 0.7278	OL: 0.9554	AB: 0.9453
OB: 0.5003	OB: 0.5172	OB: 0.4954	OB: 0.4976	OB: 0.5419	OB: 0.3868	OB: 0.5359
AB: 0.0025	AB: 0.01497	AB: 0.0378	AB: 0.0057	AB: 0.2303	AB: 0.1577	OL: 0.01885

AB, arthroscopic Bankart repair; OB, open Bankart repair; OL, open Latarjet.

Table 3 Clinical Outcomes

Recurrent Instability	Recurrent Dislocations	Revisions	Revisions Due to Recurrence	Return to Play	Total Complications
OL: 9.7%	OL: 4.0%	OL: 4.9%	OL: 1.4%	OL: 80.0%	AB: 2.2%
OB: 10.7%	OB: 5.9%	OB: 6.1%	OB: 4.6%	OB: 77.4%	OB: 3.5%
AB: 21.7%	AB: 10.3%	AB: 11.6%	AB: 11.2%	AB: 75.2%	OL: 5.7%

AB, arthroscopic Bankart repair; OB, open Bankart repair; OL, open Latarjet.

of the odds ratio and P-scores as these are based on both direct and indirect comparisons.

Discussion

The most important finding from our study was that the open Latarjet procedure resulted in the highest P-score for rates of recurrence, recurrent dislocations, total revision rates, revisions due to recurrence, and return to sport. The open and arthroscopic Latarjet resulted in comparable clinical outcomes in comparative studies. However, the Latarjet procedures resulted in a higher rate of complications, although the rate of total revisions was still lowest with the Latarjet procedure.

Several previous meta-analyses have been conducted comparing the open and arthroscopic Bankart repairs, Bankart repairs with the Latarjet procedure, and the open versus arthroscopic Latarjet procedure. These have found mixed conclusions regarding the superiority of the treatments over one another.[14,49-51] The advantage of a network meta-analysis is that it allows for comparison of the five shoulder stabilization procedures and allows them to be ranked. The P-score represents the probability that the surgical procedure is the ideal method for an optimal result in each outcome measure. The P-score does not represent the magnitude of difference between the surgical procedures and it does not signify clinically significant differences.

The long-term follow-up of the included studies was sufficient to allow for an accurate comparison of the five procedures, as the time to failure of the procedures varies.[8,12,44] Outcomes following the Latarjet procedure were stable over time, with the majority of failures occurring within the first year, whereas with the Bankart repair, the majority of the deterioration occurred in the mid- to long-term follow-up.[8,12,44] Many of the included studies chose the Latarjet procedure for patients with greater confounding risk factors for recurrence such as increased glenoid bone loss, large Hill-Sachs lesions, participation in contact athletics, and a greater number of previous dislocations.[8,12] Arthroscopic Bankart repair with remplissage was primarily used for patients with Hill-Sachs lesions, and it seems to be a viable treatment in this setting. Further high-level studies also controlling for bone-loss would be of great interest, as this is the main deciding factor for many surgeons in choosing a procedure.[52]

Functional outcomes were comparable, with similar Rowe scores. However, the rate of return to sport was highest in the Latarjet group. Additionally, studies have found high rates of return in both collision and non-collision athletes.[53-56] Warth et al.[57] found this to be the most important factor for patients, as they valued return to sports more than preventing further shoulder dislocation. The open and arthroscopic Bankart repair have the advantage of restoring the native anatomy of the joint and preserving joint range of motion, which may be preferable in younger athletes or patients with lower risk factors for recurrent revision such as non-contact sports. With the Latarjet procedure and the arthroscopic Bankart repair with additional remplissage, there is a concern due to the non-anatomic nature of the procedure potentially leading to decreased range of motion. While we were unable to assess range of motion due to the heterogeneity of reported assessment measures in the literature, two of the included studies found a similar range of motion between the Latarjet procedure and Bankart repairs.[40,43]

The Bankart repair is commonly performed via an arthroscopic approach and accounts for 89% of all shoulder stabilization procedures in the United States.[5,58] While there has been concern that this technique may lead to inferior outcomes compared to the open approach, our study found that that the majority of outcomes were comparable. However, total recurrent instability and revisions were still higher in patients treated arthroscopically compared to those treated with the open approach. Despite this, the arthroscopic ap-

proach is still favored primarily due to its perceived lower complication rate as a result of its minimally invasive approach, which our study confirmed. The arthroscopic approach also has the advantage of allowing for diagnostic evaluation of concomitant shoulder pathology at the time of surgery. Both of these techniques should be used with caution in the setting of glenoid bone loss, as studies have found increased recurrence rates when glenoid bone loss exceeds 15%.[59,60]

Concerns still exist with performing a primary Latarjet procedure, in large part due to the higher risk of complications.[11] While our study found the rate of complications other than recurrence to be highest among all treatment groups, the overall rate of revision surgery was still lowest with the Latarjet procedure. Registry studies have found similar higher rates of complications following the Latarjet procedure in the United States.[61] It is worth noting that the complications associated with the Latarjet procedure have the potential for serious morbidity, including infection, neurovascular injury, and deep venous thrombosis.[10-12] These factors are important in counselling and consenting patients for shoulder stabilization surgery.

Limitations

This study has several limitations and potential biases, including the limitations of the included studies themselves. The biggest limitation is that due to the lack of standardized reporting, it was not possible to account for differences in patients with varying degrees of bone loss and prior surgical treatment; this information would be very beneficial as these are important factors for deciding which treatment option to choose. Most of the included studies were retrospective, and there were no randomized controlled trials including the Latarjet procedure, thereby limiting our analysis and the strength of our conclusions. There is also a considerable variation in surgical techniques between surgeons, which may affect the outcome.[61]

Conclusion

Our network meta-analysis found the open Latarjet procedure had the lowest recurrence rates, lowest revisions rates, and highest rates of return to play in the surgical treatment of anterior shoulder instability. However, the Latarjet procedure has been shown to result in a higher complication rates, which needs to be considered when deciding which stabilization procedure to perform.

Disclosure Statement

None of the authors have a financial or proprietary interest in the subject matter or materials discussed herein, including, but not limited to, employment, consultancies, stock ownership, honoraria, and paid expert testimony.

References

1. Dumont GD, Russell RD, Robertson WJ. Anterior shoulder instability: a review of pathoanatomy, diagnosis and treatment. Curr Rev Musculoskelet Med. 2011;4(4):200-7.
2. Headey J, Brooks JH, Kemp SP. The epidemiology of shoulder injuries in English professional rugby union. Am J Sports Med. 2007;35(9):1537-43.
3. Balke M, Shafizadeh S, Bouillon B, Banerjee M. Management of shoulder instability: the current state of treatment among German orthopedic surgeons. Arch Orthop Trauma Surg. 2016;136(12):1717-21.
4. Castagna A, Garofalo R, Conti M, Flanagin B. Arthroscopic Bankart repair: Have we finally reached a gold standard? Knee Surg Sports Traumatol Arthrosc. 2016;24(2):398-405.
5. Zhang AL, Montgomery SR, Ngo SS, et al. Arthroscopic versus open shoulder stabilization: current practice patterns in the United States. Arthroscopy. 2014;30(4):436-43.
6. Buza JA, Iyengar JJ, Anakwenze OA, et al. Arthroscopic Hill-Sachs Remplissage: A Systematic Review. J Bone Joint Surg Am. 2014;96(7):549-55.
7. Murphy AI, Hurley ET, Hurley DJ, et al. Long-term outcomes of the arthroscopic Bankart repair: a systematic review of studies at 10-year follow-up. J Shoulder Elbow Surg. 2019 Nov;28(11):2084-9.
8. Zimmermann SM, Scheyerer MJ, Farshad M, et al. Long-term restoration of anterior shoulder stability: a retrospective analysis of arthroscopic Bankart repair versus open Latarjet procedure. J Bone Joint Surg Am. 2016;98(23):1954-61.
9. Hurley ET, Jamal S, Ali ZS, Montgomery C, et al. Long-term outcomes of the Latarjet procedure for anterior shoulder instability: a systematic review of studies at 10-year follow-up. J Shoulder Elbow Surg. 2019;28(2):e33-9.
10. Dauzère F, Faraud A, Lebon J, et al. Is the Latarjet procedure risky? Analysis of complications and learning curve. Knee Surg Sports Traumatol Arthrosc. 2016;24(2):557-63.
11. Delaney RA, Freehill MT, Janfaza DR, et al. 2014 Neer Award paper: neuromonitoring the Latarjet procedure. J Shoulder Elbow Surg. 2014;23(10):1473-80.
12. Griesser MJ, Harris JD, McCoy BW, et al. Complications and re-operations after Bristow-Latarjet shoulder stabilization: a systematic review. J Shoulder Elbow Surg. 2013;22(2):286-92.
13. Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. BMJ. 2009 Jul 21;339:b2700.
14. Hohmann E, Tetsworth K, Glatt V. Open versus arthroscopic surgical treatment for anterior shoulder dislocation: a comparative systematic review and meta-analysis over the past 20 years. J Shoulder Elbow Surg. 2017;26(10):1873-80.
15. Wells GA, Shea B, O'Connell D, et al. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses. Ottawa Hospital Research Institute. Available at: http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp.
16. Rücker G, Schwarzer G, Krahn U, König J. netmeta: Network Meta-Analysis using Frequentist Methods. R package version 0.9-6. Available at: https://CRAN.R-project.org/package=netmeta.
17. Hozo SP, Djulbegovic B, Hozo I. Estimating the mean and variance from the median, range, and the size of a sample. BMC Med Res Methodol. 2015 Apr 20;5:13.
18. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring

inconsistency in meta- analysis. BMJ. 2003;327(7414):557-60.
19. Riboh JC, Cvetanovich GL, Cole BJ, Yanke AB. Comparative efficacy of cartilage repair procedures in the knee: a network meta-analysis. Knee Surg Sports Traumatol Arthrosc. 2017;25(12):3786-99.
20. Rücker G, Schwarzer G. Ranking treatments in frequentist network meta-analysis works without resampling methods. BMC Med Res Methodol. 2015 Jul 31;15:58.
21. Bottoni CR, Smith EL, Berkowitz MJ, et al. Arthroscopic versus open shoulder stabilization for recurrent anterior instability: a prospective randomized clinical trial. Am J Sports Med. 2006;34(11):1730-7.
22. Cole BJ, L'Insalata J, Irrgang J, Warner JJ. Comparison of arthroscopic and open anterior shoulder stabilization. A two to six-year follow-up study. J Bone Joint Surg Am. 2000;82(8):1108-14.
23. Fabbriciani C, Milano G, Demontis A, et al. Arthroscopic versus open treatment of Bankart lesion of the shoulder: a prospective randomized study. Arthroscopy. 2004;20(5):456-62.
24. Hubbell JD, Ahmad S, Bezenoff LS, et al. Comparison of shoulder stabilization using arthroscopic transglenoid sutures versus open capsuolabral repairs. A 5-year minimum follow-up. Am J Sports Med. 2004;32(3):650-4.
25. Karlsson J, Magnusson L, Ejerhed L, et al. Comparison of open and arthroscopic stabilization for recurrent shoulder dislocation in patients with a Bankart lesion. Am J Sports Med. 2001;29(5):538-42.
26. Kim SH, Ha KI, Kim SH. Bankart repair in traumatic anterior shoulder instability: open versus arthroscopic technique. Arthroscopy. 2002;18(7):755-63.
27. Lützner J, Krummenauer F, Lübcke J, et al. Functional outcome after open and arthroscopic Bankart repair for traumatic shoulder instability. Eur J Med Res. 2009;14(1):18-24.
28. Mahirogullari M, Özkan H, Akyüz M, et al. Comparison between the results of open and arthroscopic repair of isolated traumatic anterior instability of the shoulder. Acta Orthop Traumatol Turc. 2010;44(3):180-5.
29. Mohtati NG, Chan DS, Hollinshead RM, et al. 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. 2014;96(5):353-60.
30. Netto NA, Tamaoki MJ, Lenza M, et al. Treatment of Bankart lesions in traumatic anterior instability of the shoulder: a randomized controlled trial comparing arthroscopy and open techniques. Arthroscopy. 2012;28(7):900-8.
31. Owens BD, Cameron KL, Peck KY, et al. Arthroscopic versus open stabilization for anterior shoulder subluxations. Orthop J Sports Med. 2015;3(1):2325967115571084.
32. Rhee YG, Ha JH, Cho NS. Anterior shoulder stabilization in collision athletes. Arthroscopic versus open Bankart repair. Am J Sports Med. 2006;34(6):979-85.
33. Sperber A, Hamberg P, Karlsson J, et al. Comparison of an arthroscopic and an open procedure for posttraumatic instability of the shoulder: a prospective randomized multicentre study. J Shoulder Elbow Surg. 2001;10(2):105-8.
34. Sperling JW, Duncan SM, Torchia ME, et al. Bankart repair in patients aged fifty years or greater: results of arthroscopic and open repairs. J Shoulder Elbow Surg. 2005;14(2):111-3.
35. Tjoumakaris FP, Abboud JA, Hasan SA, et al. Arthroscopic and open Bankart repairs provide similar outcomes. Clin Orthop Relat Res. 2006;446:227-32.
36. Uchiyama Y, Handa A, Shimpuku E, et al. Open Bankart repair plus inferior capsular shift versus arthroscopic Bankart repair without augmentations for traumatic anterior shoulder instability: A prospective study. J Orthop Surg (Hong Kong). 2017;25(3):2309499017727947.
37. Virk MS, Manzo RL, Cote M, et al. Comparison of time to recurrence of instability after open and arthroscopic Bankart repair techniques. Orthop J Sports Med. 2016;4(6):2325967116654114.
38. Wang C, Ghalambor N, Zarins B, Warner JP. Arthroscopic versus open Bankart repair: analysis of patient subjective outcome and cost. Arthroscopy. 2005;21(10):1219-22.
39. Zaffagnini S, Muccioli GM, Giordano G, et al. Long-term outcomes after repair of recurrent post-traumatic anterior shoulder instability: comparison of arthroscopic transglenoid suture and open Bankart reconstruction. Knee Surg Sports Traumatol Arthrosc. 2012;20(5):816-21.
40. Bessière C, Trojani C, Carles M, et al. The open Latarjet procedure is more reliable in terms of shoulder stability than arthroscopic Bankart repair. Clin Orthop Relat Res. 2014;472(8):2345-51.
41. Blonna D, Bellato E, Caranzano F, et al. Arthroscopic Bankart repair versus open Bristow-Latarjet for shoulder instability: a matched-pair multicenter study focused on return to sport. Am J Sports Med. 2016;44(12):3198-205.
42. Cho NS, Yoo JH, Rhee YG. Management of an engaging Hill-Sachs lesion: arthroscopic remplissage with Bankart repair versus Latarjet procedure. Knee Surg Sports Traumatol Arthrosc. 2016;24(12):3793-800.
43. Russo R, Della Rotonda G, Cautiero F, et al. Arthroscopic Bankart repair associated with subscapularis augmentation (ASA) versus open Latarjet to treat recurrent anterior shoulder instability with moderate glenoid bone loss: clinical comparison of two series. Musculoskelet Surg. 2017;101(1):75-83.
44. Zarezade A, Dehghani M, Rozati AR, et al. Comparison of Bristow procedure and Bankart arthroscopic method as the treatment of recurrent shoulder instability. Adv Biomed Res. 2014 Dec 12;3:256.
45. Aydin A, Usta M, Topal M, et al. Comparison of open Bankart repair versus modified Bristow operation for the treatment of traumatic recurrent anterior dislocation and capsular laxity of the shoulder. Eurasian J Med. 2012;44(3):157.
46. Hovelius LK, Sandström BC, Rösmark DL, et al. Long-term results with the Bankart and Bristow-Latarjet procedures: recurrent shoulder instability and arthropathy. J Shoulder Elbow Surg. 2001;10(5):445-52.
47. Hovelius L, Vikerfors O, Olofsson A, et al. Bristow-Latarjet and Bankart: a comparative study of shoulder stabilization in 185 shoulders during a seventeen-year follow-up. J Shoulder Elbow Surg. 2011;20(7):1095-101.
48. Mahirogullari M, Kuskucu M, Solakoglu C, et al. Comparison of outcomes of two different surgeries in regarding to complications for chronic anterior shoulder instability. Arch Orthop Trauma Surg. 2006;126(10):674-9.
49. An VV, Sivakumar BS, Phan K, Trantalis J. A systematic review and meta-analysis of clinical and patient-reported

outcomes following two procedures for recurrent traumatic anterior instability of the shoulder: Latarjet procedure vs. Bankart repair. J Shoulder Elbow Surg 2016;25(5):853-63.
50. Hurley ET, Lim Fat D, Farrington SK, Mullett H. Open Versus Arthroscopic Latarjet Procedure for Anterior Shoulder Instability: A Systematic Review and Meta-analysis. Am J Sports Med. 2018 Apr:47(5):1248-53.
51. Petrera M, Patella V, Patella S, Theodoropoulos J. A meta-analysis of open versus arthroscopic Bankart repair using suture anchors. Knee Surg Sports Traumatol Arthrosc. 2010;18(12):1742-7.
52. Thomazeau H, Courage O, Barth J, et al. Can we improve the indication for Bankart arthroscopic repair? A preliminary clinical study using the ISIS score. Orthop Traumatol Surg Res. 2010;96(8):S77-83.
53. Kawasaki T, Hasegawa Y, Kaketa T, et al. Midterm Clinical Results in Rugby Players Treated With the Bristow Procedure. Am J Sports Med. 2018;46(3):656-62.
54. Kee YM, Kim JY, Kim HJ, et al. Return to sports after the Latarjet procedure: high return level of non-collision athletes. Knee Surg Sports Traumatol Arthrosc. 2018;36(3):919-25.
55. Privitera DM, Sinz NJ, Miller LR, et al. Clinical Outcomes Following the Latarjet Procedure in Contact and Collision Athletes. J Bone Joint Surg Am. 2018;100(6):459-65.
56. Hurley ET, Montgomery C, Jamal MS, et al. Return to Play After the Latarjet Procedure for Anterior Shoulder Instability: A Systematic Review. Am J Sports Med. 2019 Oct;47(12):3002-8.
57. Warth RJ, Briggs KK, Dornan GJ, et al. Patient expectations before arthroscopic shoulder surgery: correlation with patients' reasons for seeking treatment. J Shoulder Elbow Surg. 2013;22(12):1676-81.
58. Owens BD, Harrast JJ, Hurwitz SR, et al. Surgical trends in Bankart repair: an analysis of data from the American Board of Orthopaedic Surgery certification examination. Am J Sports Med. 2011;39(9):1865-9.
59. Leroux TS, Saltzman BM, Meyer M, et al. The influence of evidence-based surgical indications and techniques on failure rates after arthroscopic shoulder stabilization in the contact or collision athlete with anterior shoulder instability. Am J Sports Med. 2017;45(5):1218-25.
60. Provencher MT, Bhatia S, Ghodadra NS, et al. Recurrent shoulder instability: current concepts for evaluation and management of glenoid bone loss. J Bone Joint Surg Am. 2010;92 Suppl 2:133-51.
61. Bokshan SL, DeFroda SF, Owens BD. Comparison of 30-day morbidity and mortality after arthroscopic Bankart, open Bankart and Latarjet-Bristow procedures: A review of 2864. Orthop J Sports Med. 2017;5(7):2325967117713163.
62. Cowling PD, Akhtar MA, Liow RYL. What is a Bristow-Latarjet procedure? Bone Joint J. 2016;98-B(9):1208-14.