Editorial Commentary: Is It Time to Take a Stand? When Arthroscopic Bankart Repair Is No Longer a Viable Option for Anterior Shoulder Instability

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Abstract: Recurrent anterior instability remains a challenging pathology to treat effectively. Arthroscopic Bankart repair, with its low invasiveness and complication rates, is readily the first, as well as most commonly, used procedure. However, some outcomes studies have reported an unacceptably high failure rate. As such, the ideal candidate for an arthroscopic repair has yet to be fully defined, mainly because of the multiple risk factors for failure after arthroscopic instability repair. Among those factors, recurrence of an instability event is clearly a risk factor for worse outcomes after arthroscopic instability repair. This may be due to an association between recurrent instability and an increase in glenoid bone loss, humeral bone loss, and more extensive labral tears, as well as more capsular, ligamentous, and rotator cuff injuries. Patients who present with 2 preoperative dislocations and a duration of instability symptoms of more than 6 months, as well as off-track Hill-Sachs lesions, may not be ideal candidates for arthroscopic instability repair. There is a "cost" to waiting on surgery after a first dislocation.

See related article on page 2530

Recurrent anterior instability remains a challenging pathology to treat effectively. Arthroscopic Bankart repair, with its low invasiveness and complication rates, is readily the first, as well as most commonly, used procedure. However, some outcomes studies have reported an unacceptably high failure rate as high as 19% to 31%.[1-6] As such, the ideal candidate for an arthroscopic repair has yet to be fully defined. This uncertainty is mainly due to the multiple, and still unknown, risk factors for failure after arthroscopic instability repair. In "Risk Factors for Recurrence of Anterior-Inferior Instability of the Shoulder After Arthroscopic Bankart Repair in Patients Below 30 Years of Age," Lee, Lim, and Kim[7] provide important information regarding patient selection for arthroscopic Bankart repair that will impact our practice of instability surgery.

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Lee et al.[7] use retrospective case-control methods to evaluate a total of 170 patients with shoulder instability. Overall, the authors report a recurrence rate of 18.8%. In addition, patients were categorized into 2 groups: those with recurrent instability and those without (only 1 instability event). When the risk factors of the groups were compared, the authors found that the time interval between first dislocation and surgery, as well as a presence of an off-track Hill-Sachs lesion, were significant prognostic factors for overall recurrence rate. In other words, those with a longer duration of instability symptoms, defined in this group as more than 6 months, had a higher failure rate after arthroscopic stabilization. Although their findings may not be completely intuitive, there is emerging evidence that supports their study findings. Certainly, we know from Drs. Lee, Lim, and Kim's article[7] that those with recurrent anterior dislocations in the shoulder demonstrated a higher prevalence of more anteroinferior labral lesions and bony lesions.[8] The emerging evidence would demonstrate an increase in glenoid bone loss, humeral bone loss, more extensive labral tears, as well as more capsular injuries.[8-18] For example, Nakagawa et al.[9] demonstrated an increase of bipolar bone lesions from 33.3% in shoulders with primary instability to 61.8% in shoulders with recurrent instability. The latest

evidence suggests that recurrence of an instability event is continuing to emerge as a risk factor for worse outcomes after arthroscopic instability repair.[19-25]

Pathologic Changes After Instability Events

Why is there an issue with lesser outcomes in patients who have recurrent instability event(s) prior to surgical stabilization? The answers lie in the pathologic changes that occur with multiple instability recurrences, such as:

- Glenoid bone loss: Increased number and size of bony Bankart lesions,[8] more attritional bone loss,[10,11] development inverted-pear glenoid,[12] and cartilage and degenerative joint changes.[13-15]
- Humerus lesions: Increased prevalence of Hill-Sachs lesion, greater chance of having engaging Hill-Sachs specifically,[12] off-track Hill-Sachs,[13,16] and more bipolar lesions.[9]
- Glenohumeral joint capsule: Increased plastic and/or permanent deformation, elongation, and/or compromise of the anterior inferior capsule[17] and superior inferior capsule.[18]
- Ligaments of the shoulder: There is increased inferior glenohumeral ligament complex compromise,[17] anterior labral ligamentous periosteal sleeve avulsion,[26] humeral avulsion of the glenohumeral ligament, glenolabral articular disruption, and rotator interval lesions.[27,28]
- Labrum: More extensive labral tears, increased incidence of circumferential labral tears, 270° labral tears,[26] posterior labral tears, and superior labral tear from anterior to posterior tears.[29]
- Rotator cuff: Rotator cuff tears[30-33] and subscapularis insufficiency (typically in older patients).

Clinical Outcomes After Multiple Recurrence and/or Prolonged Instability Symptoms

As evidenced by primary surgical intervention outcomes studies, despite the approach, we are achieving suboptimal results, and the underlying cause may very well be patient selection and lack of awareness of the underlying contributing risk factors. Consider the following studies.

Primary Arthroscopic Repair

- Owens et al.[6]: Approximately 31% of individuals went on to have recurrent instability, at a mean time of 17 months.
- Franceschi et al.[34]: A minimum of 5-year follow-up, 17% experienced recurrent instability during the follow-up period. Five patients had degenerative changes glenohumeral joint changes before surgery, 2 of these individuals had osteoarthritic progression at 5 years. Observed severe cartilage degenerative changes in shoulders with more than 3 anchors.
- Kavaja et al.[35]: A mean follow-up of 13 years, radiographic evidence of glenohumeral osteoarthritis was high (68%), but 80% of individuals were classified as mild and did as well as individuals who did not have radiographic evidence of osteoarthritis.

Primary open Bankart repair

Even with open repair, there is still a high level of recurrence.

- Owens et al.[6]: Similar to arthroscopic cohort, approximately 31% of individuals went on to have recurrent instability, at a mean time of 17 months.
- Boileau et al.[36]: Recurrent instability was observed in 11% of individuals at a mean time of 25 months. Seventy-one percent of individuals with recurrent instability went on to have a revision Latarjet procedure. Before the index surgery 4% of patients had clinically observable osteoarthritic changes; however, after the surgery 17% showed osteoarthritic changes.

Primary Latarjet

Although the Latarjet is touted as an outstanding option, not all studies have shown optimal outcomes.

- Hovelius et al.[37] and Allain et al.[38]: Recurrent shoulder dislocation rate of 0% to 0.8%.
- Hovelius et al.,[37] Allain et al.,[38] and Schroder et al.[39]: Recurrent subluxation rate of 2% to 15%.
- Spoor et al.,[40] Hovelius et al.,[37] Allain et al.,[38] and Schroder et al.[39]: Revision surgery rate of 0% to 15%.

Lee et al.[7] used a patient population that was well-stratified and included anterior and inferior shoulder instability, Bankart lesion, or anterior labral periosteal sleeve avulsions that were all fixed in a similar manner with arthroscopic capsulolabral repair with 3 or more anchors. In addition, the authors only included those patients under the age of 30 with a minimum 2 years of follow-up. They excluded large glenoid bone loss injuries (>25% of glenoid surface) and also defined Hill-Sachs lesions as being on-track or off-track. A standardized rehabilitation protocol was used, and patients were allowed to return to full participation at 6 months. Of paramount importance was their definition of failure as either redislocation as verified by radiographs or subluxation was defined as a sense of dislocation with a positive anterior apprehension test. The authors used a strict definition of instability to include any patient with a recurrent dislocation or a recurrent instability event. It should be noted that the definition of instability has a profound effect on the overall recurrence rate in shoulder instability, but the authors used very strict criteria to likely give a true picture of their success.

The authors also assessed whether other patient-specific variables were telling of recurrence. They reviewed whether the age was less than 20 (vs 20-30 years old), male versus female, dominance of injured side, participation in collision sports, and number of preoperative dislocations) as well as the time interval between first dislocation and surgery (<6 months vs ≥6 months). Generalized hyperlaxity (defined as a Beighton score of ≥2), bony Bankart lesion, concomitant superior labral tear from anterior to posterior or posterior labral lesion, and Hill-Sachs lesion (on-track vs off-track) were assessed as well. A robust logistic regression was performed to analyze the influence of each risk factor. In this challenging shoulder instability population, overall 32 of the 170 patients had recurrent instability, which was 18.8% of the cohort. Twelve patients had a redislocation, and 20 had a subluxation with positive apprehension test. As far as risk factors are for concern, more than 2 preoperative dislocations were predictive of failure. More than 6 months of elapsed time from initial instability event to surgery, as well as off-track Hill-Sachs lesions were significantly associated with this failure rate.

There may be potential bias of the cohort in that there was a mismatch in terms of numbers in the recurrence (32 patients) versus single instability episode (138 patients) group. However, the authors mitigated this potential bias, given that the most notable findings were in those with recurrent instability, which was the lesser populated group. Also, there may be some concern with the use of magnetic resonance imaging for the qualification of on-track and off-track lesions, but has been recently validated in a study by Gyftopoulos et al.,[41] where it was reported that an on-track off-track magnetic resonance imaging accurately assesses these important lesions.[42]

Several common themes have come to the forefront among recent studies, as the field's understanding evolves. This article does a great job to clarify those risk factors, including total length of instability symptoms, bone loss issues, especially off-track lesions, and the number of preoperative dislocations. Based on the work of Lee et al.,[7] as well as others, the emerging evidence is becoming clearer: Recurrent instability is a negative prognostic factor.

It may finally be time to take a stand with regard to those patients who have recurrent instability or a prolonged (>6 months) history of instability. The emerging evidence is clear. The failure rate is much higher, and patients who have recurrent instability or an extended duration of symptoms should likely be placed into a different category, as well as educated about the greater chance of failure (with both arthroscopic and open methods). Thus patients who present to us with multiple recurrences, with more than 2 preoperative dislocations, and a duration of instability symptoms of more than 6 months, as well as identified off-track Hill-Sachs lesions loss may not be ideal candidates for arthroscopic instability repair. The importance of this study is how we better identify patients who will be successfully treated with arthroscopic repair. In addition, one can also use these data to show that there is a potential cost to waiting on surgery after a first instability event, culminating in overall poorer outcomes. What is exciting about this work and others is that clinicians can now readily identify patients in clinic at greater risk for failure after arthroscopic instability repair. The time is near, and perhaps it is now, to take a stand regarding treatment for those patients who experience recurrent instability or have a prolonged history of instability events.

References

1. Sugaya H, Moriishi J, Kanisawa I, Tsuchiya A. Arthroscopic osseous Bankart repair for chronic recurrent traumatic anterior glenohumeral instability. Surgical technique. *J Bone Joint Surg Am* 2006;88:159-169 (suppl 1 pt 2).
2. Hobby J, Griffin D, Dunbar M, Boileau P. 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* 2007;89:1188-1196.
3. Kim SH, Ha KI, Kim SH. Bankart repair in traumatic anterior shoulder instability: Open versus arthroscopic technique. *Arthroscopy* 2002;18:755-763.
4. Thal R, Nofziger M, Bridges M, Kim JJ. Arthroscopic Bankart repair using Knotless or BioKnotless suture anchors: 2- to 7-year results. *Arthroscopy* 2007;23:367-375.
5. Voos JE, Livermore RW, Feeley BT, et al. Prospective evaluation of arthroscopic Bankart repairs for anterior instability. *Am J Sports Med* 2010;38:302-307.
6. Owens BD, Cameron KL, Peck KY, et al. Arthroscopic versus open stabilization for anterior shoulder subluxations. *Orthop J Sports Med* 2015;3:2325967115571084.
7. Lee SH, Lim KH, Kim JW. Risk factors for recurrence of anterior-inferior instability of the shoulder after arthroscopic Bankart repair in patients below 30 years of Age. *Arthroscopy* 2018;34:2530-2536.
8. Kim DS, Yoon YS, Yi CH. Prevalence comparison of accompanying lesions between primary and recurrent anterior dislocation in the shoulder. *Am J Sports Med* 2010;38:2071-2076.
9. Nakagawa S, Ozaki R, Take Y, Iuchi R, Mae T. Relationship between glenoid defects and Hill-Sachs lesions in shoulders with traumatic anterior instability. *Am J Sports Med* 2015;43:2763-2773.
10. Mologne TS, Provencher MT, Menzel KA, Vachon TA, Dewing CB. Arthroscopic stabilization in patients with an inverted pear glenoid: Results in patients with bone loss of the anterior glenoid. *Am J Sports Med* 2007;35:1276-1283.
11. Piasecki DP, Verma NN, Romeo AA, Levine WN, Bach BR Jr, Provencher MT. Glenoid bone deficiency in recurrent anterior shoulder instability: Diagnosis and management. *J Am Acad Orthop Surg* 2009;17:482-493.

12. Burkhart SS, De Beer JF. Traumatic glenohumeral bone defects and their relationship to failure of arthroscopic Bankart repairs: Significance of the inverted-pear glenoid and the humeral engaging Hill-Sachs lesion. *Arthroscopy* 2000;16:677-694.
13. Di Giacomo G, de Gasperis N, Scarso P. Bipolar bone defect in the shoulder anterior dislocation. *Knee Surg Sports Traumatol Arthrosc* 2016;24:479-488.
14. Leyh M, Seitz A, Durselen L, et al. Subchondral bone influences chondrogenic differentiation and collagen production of human bone marrow-derived mesenchymal stem cells and articular chondrocytes. *Arthritis Res Ther* 2014;16:453.
15. Huebner JL, Hanes MA, Beekman B, TeKoppele JM, Kraus VB. A comparative analysis of bone and cartilage metabolism in two strains of guinea-pig with varying degrees of naturally occurring osteoarthritis. *Osteoarthritis Cartilage* 2002;10:758-767.
16. Omori Y, Yamamoto N, Koishi H, et al. Measurement of the glenoid track in vivo as investigated by 3-dimensional motion analysis using open MRI. *Am J Sports Med* 2014;42:1290-1295.
17. Bigliani LU, Pollock RG, Soslowsky LJ, Flatow EL, Pawluk RJ, Mow VC. Tensile properties of the inferior glenohumeral ligament. *J Orthop Res* 1992;10:187-197.
18. Hsu YC, Pan RY, Shih YY, Lee MS, Huang GS. Superior-capsular elongation and its significance in atraumatic posteroinferior multidirectional shoulder instability in magnetic resonance arthrography. *Acta Radiol* 2010;51:302-308.
19. Milano G, Grasso A, Russo A, et al. Analysis of risk factors for glenoid bone defect in anterior shoulder instability. *Am J Sports Med* 2011;39:1870-1876.
20. Boileau P, Villalba M, Hery JY, Balg F, Ahrens P, Neyton L. Risk factors for recurrence of shoulder instability after arthroscopic Bankart repair. *J Bone Joint Surg Am* 2006;88:1755-1763.
21. Randelli P, Ragone V, Carminati S, Cabitza P. Risk factors for recurrence after Bankart repair a systematic review. *Knee Surg Sports Traumatol Arthrosc* 2012;20:2129-2138.
22. Ahmed I, Ashton F, Robinson CM. Arthroscopic Bankart repair and capsular shift for recurrent anterior shoulder instability: Functional outcomes and identification of risk factors for recurrence. *J Bone Joint Surg Am* 2012;94:1308-1315.
23. Flinkkila T, Hyvonen P, Ohtonen P, Leppilahti J. Arthroscopic Bankart repair: Results and risk factors of recurrence of instability. *Knee Surg Sports Traumatol Arthrosc* 2010;18:1752-1758.
24. Locher J, Wilken F, Beitzel K, et al. Hill-Sachs off-track lesions as risk factor for recurrence of instability after arthroscopic Bankart repair. *Arthroscopy* 2016;32:1993-1999.
25. Porcellini G, Campi F, Pegreffi F, Castagna A, Paladini P. Predisposing factors for recurrent shoulder dislocation after arthroscopic treatment. *J Bone Joint Surg Am* 2009;91:2537-2542.
26. Mazzocca AD, Cote MP, Solovyova O, Rizvi SH, Mostofi A, Arciero RA. Traumatic shoulder instability involving anterior, inferior, and posterior labral injury: A prospective clinical evaluation of arthroscopic repair of 270 degrees labral tears. *Am J Sports Med* 2011;39:1687-1696.
27. Harryman DT 2nd, Sidles JA, Harris SL, Matsen FA 3rd. The role of the rotator interval capsule in passive motion and stability of the shoulder. *J Bone Joint Surg Am* 1992;74:53-66.
28. Mologne TS, Zhao K, Hongo M, Romeo AA, An KN, Provencher MT. The addition of rotator interval closure after arthroscopic repair of either anterior or posterior shoulder instability: Effect on glenohumeral translation and range of motion. *Am J Sports Med* 2008;36:1123-1131.
29. Rodosky MW, Harner CD, Fu FH. The role of the long head of the biceps muscle and superior glenoid labrum in anterior stability of the shoulder. *Am J Sports Med* 1994;22:121-130.
30. Porcellini G, Caranzano F, Campi F, Paladini P. Instability and rotator cuff tear. *Med Sport Sci* 2012;57:41-52.
31. Porcellini G, Caranzano F, Campi F, Pellegrini A, Paladini P. Glenohumeral instability and rotator cuff tear. *Sports Med Arthrosc Rev* 2011;19:395-400.
32. Gombera MM, Sekiya JK. Rotator cuff tear and glenohumeral instability: A systematic review. *Clin Orthop Relat Res* 2014;472:2448-2456.
33. Porcellini G, Paladini P, Campi F, Paganelli M. Shoulder instability and related rotator cuff tears: Arthroscopic findings and treatment in patients aged 40 to 60 years. *Arthroscopy* 2006;22:270-276.
34. Franceschi F, Papalia R, Del Buono A, Vasta S, Maffulli N, Denaro V. Glenohumeral osteoarthritis after arthroscopic Bankart repair for anterior instability. *Am J Sports Med* 2011;39:1653-1659.
35. Kavaja L, Pajarinen J, Sinisaari I, et al. Arthrosis of glenohumeral joint after arthroscopic Bankart repair: A long-term follow-up of 13 years. *J Shoulder Elbow Surg* 2012;21:350-355.
36. Boileau P, Fourati E, Bicknell R. Neer modification of open Bankart procedure: What are the rates of recurrent instability, functional outcome, and arthritis? *Clin Orthop Relat Res* 2012;470:2554-2560.
37. Hovelius L, Sandstrom B, Saebo M. One hundred eighteen Bristow-Latarjet repairs for recurrent anterior dislocation of the shoulder prospectively followed for fifteen years: Study II-the evolution of dislocation arthropathy. *J Shoulder Elbow Surg* 2006;15:279-289.
38. Allain J, Goutallier D, Glorion C. Long-term results of the Latarjet procedure for the treatment of anterior instability of the shoulder. *J Bone Joint Surg Am* 1998;80:841-852.
39. Schroder DT, Provencher MT, Mologne TS, Muldoon MP, Cox JS. The modified Bristow procedure for anterior shoulder instability: 26-year outcomes in Naval Academy midshipmen. *Am J Sports Med* 2006;34:778-786.
40. Spoor AB, de Waal Malefijt J. Long-term results and arthropathy following the modified Bristow-Latarjet procedure. *Int Orthop* 2005;29:265-267.
41. Gyftopoulos S, Beltran LS, Bookman J, Rokito A. MRI evaluation of bipolar bone loss using the on-track off-track method: A feasibility study. *AJR Am J Roentgenol* 2015;205:848-852.
42. Di Giacomo G, Itoi E, Burkhart SS. Evolving concept of bipolar bone loss and the Hill-Sachs lesion: From "engaging/non-engaging" lesion to "on-track/off-track" lesion. *Arthroscopy* 2014;30:90-98.