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Bankart repair alone in combined Bankart and superior labral anterior-posterior lesions preserves range of motion without compromising joint stability

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Hypothesis: The purpose was to investigate joint stability and range of motion after a Bankart repair without superior labral anterior-posterior (SLAP) repair (termed "Bankart repair") and after combined Bankart and SLAP repairs (termed "combined repair").
Methods: Eight fresh-frozen shoulders were used. Combined Bankart and SLAP lesions were created (10- to 6-o'clock positions). The labrum and capsule were repaired at the 2-o'clock, 3:30 clock-face, and 5-o'clock positions in the Bankart repair group and at the 11-o'clock, 1-o'clock, 2-o'clock, 3:30 clock-face, and 5-o'clock positions in the combined repair group. The internal- and external-rotation ranges of motion were determined with the arm positioned at 0° and 60° of glenohumeral abduction. The rotation angle was defined when a constant torque of 200 N-mm was applied. Joint stability was measured with a custom stability-testing device. The peak translational force in the anterior-posterior direction was measured with the arm at the end range of external rotation.
Results: External rotation angles were greater at 0° and 60° of abduction in the Bankart repair group than in the combined repair group (0° of abduction, $P < .01$; 60° of abduction, $P < .05$). The internal rotation angle was greater at 60° of abduction in the Bankart repair group than in the combined repair group ($P < .01$). The stability between the 2 groups was not significantly different ($P = .60$).
Conclusion: In patients with combined Bankart and SLAP lesions and the need for a wide range of motion, a Bankart repair alone may provide a greater range of motion without compromising the joint stability at the end range compared with a combined repair.

A Bankart lesion occurs after a traumatic anterior dislocation of the shoulder in most patients,[4,18] and some Bankart lesions are concomitant with superior labral anterior-posterior (SLAP) lesions. Common symptoms of SLAP lesions include pain, locking, and catching sensations. These lesions are frequent in athletes who throw overhand, such as baseball players.[6] The incidence rate of combined Bankart and SLAP lesions ranges from 10.4% to 57% in patients with recurrent dislocation.[6,7,13,15,20,29,31,37] Therefore, because these lesions are not rare, it is important to establish the most effective treatment option for combined Bankart and SLAP lesions.

A SLAP tear is a common labral pathology that leads to shoulder pain and instability. These lesions were categorized into 4 types by Snyder et al.[32] Type II and type IV SLAP lesions cause instability at the origin of the biceps long head, requiring repair. Most SLAP lesions occur as isolated injuries,[14] but those that occur with Bankart lesions were classified as type V SLAP lesions by Maffet et al.[21] If the severity and extension of the labral lesion continue to worsen with time, the risk of recurrent dislocation increases.[7] When a SLAP lesion occurs in combination with a Bankart lesion in a patient with recurrent dislocation, the shoulder joint must be stabilized with a

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Bankart repair.[6,28,31,33,34] For this surgical treatment, some authors have reported that combined Bankart and SLAP repairs had favorable clinical results.[2,6,28,31,34] Alternatively, other investigators have suggested that Bankart repair alone, without SLAP repair, showed satisfactory results and that the combined repair might be associated with a decreased range of motion.[1,7,33] However, no cadaveric studies have investigated the possible mechanical benefits of concomitantly repairing SLAP lesions and Bankart lesions.

The purpose of this study was to investigate the joint stability and range of motion in cadaveric shoulders after a Bankart repair without SLAP repair (termed “Bankart repair”) and after combined Bankart and SLAP repairs (termed “combined repair”). We hypothesized that SLAP repair for combined lesions would decrease range of motion.

Methods

Specimen preparation

We used 8 fresh-frozen shoulders from 4 men and 4 women; the mean age at death was 65 years (range, 50-81 years). The shoulders were screened for rotator cuff tears, biceps tendon injury, labral tears, and radiologic evidence of moderate to severe glenohumeral osteoarthritis. The subcutaneous soft tissues were removed by dissection, whereas the rotator cuff, labrum, and joint capsule were maintained. The Bankart lesion model was made as follows: While observing from outside the joint, we first separated the labrum from the scapula at approximately the 4-o'clock position in the right shoulder. Next, the lesion was accurately spread in the superior and inferior direction while we observed the inside of the joint. Finally, a Bankart lesion (2- to 6-o'clock positions in the right shoulder) and a SLAP lesion (10- to 2-o'clock positions in the right shoulder) were created by elevating the labrum subperiosteally from the glenoid from the 10- to 6-o'clock positions. All procedures were performed by an open technique, not arthroscopically. The scapula body was removed, and the glenoid was potted in bone cement that was attached to a custom mechanical testing device. To accurately orient the glenoid articular surface parallel to the floor, 2 Kirschner wires were passed through the glenoid neck before testing,[35] 1 parallel to a line connecting the anterior and posterior aspects of the glenoid rim and 1 parallel to a line connecting the superior and inferior aspects of the glenoid rim, while the labrum was pulled up with forceps. When the wires were parallel to the floor in both directions, the glenoid articular surface was considered accurately parallel to the floor.[36]

Surgical procedure

FiberWire sutures (No. 2; Arthrex, Naples, FL, USA) were passed through 1 cm of the anterior labrum and capsule. A transosseous suture technique (Fig. 1) was used to repair lesions at the 2-o'clock, 3:30 clock-face, and 5-o'clock positions in the Bankart repair group and at the 11-o'clock, 1-o'clock, 2-o'clock, 3:30 clock-face, and 5-o'clock positions in the combined repair group. All knots were tied with a sliding-locking knot (SMC knot), followed by 3 half-hitches on alternating posts. Bankart repair and combined repair were performed in all 8 shoulders. After the range of motion and joint stability were measured for 1 repair procedure, the other repair procedure was performed and the range of motion and joint stability were again measured. The experimental procedures were conducted in an alternating fashion; the Bankart repair was tested first in odd-numbered specimens, and the combined repair was tested first in even-numbered specimens.

Testing apparatus

The testing device consisted of a 6-component load cell (JR3, Woodland, CA, USA) mounted on a motorized x-y table (Fig. 2). The x- and y-axes were defined as the anterior-posterior and superior-inferior directions, respectively, and the z-axis was defined as the medial-lateral direction. A 50-N medial compression force was applied to the humeral head by a pneumatic cylinder. The specific value of 50 N was determined based on previous studies.[9,16,19,35]

Measurements of range of motion

The internal and external axial ranges of motion were determined with the arm positioned at 0° and 60° of glenohumeral abduction (approximately 0° and 90° of arm abduction relative to the trunk). The range-of-motion angle was determined by the position of the arm when a constant torque of 200 N-mm was applied. The angles were measured with a manual goniometer and a

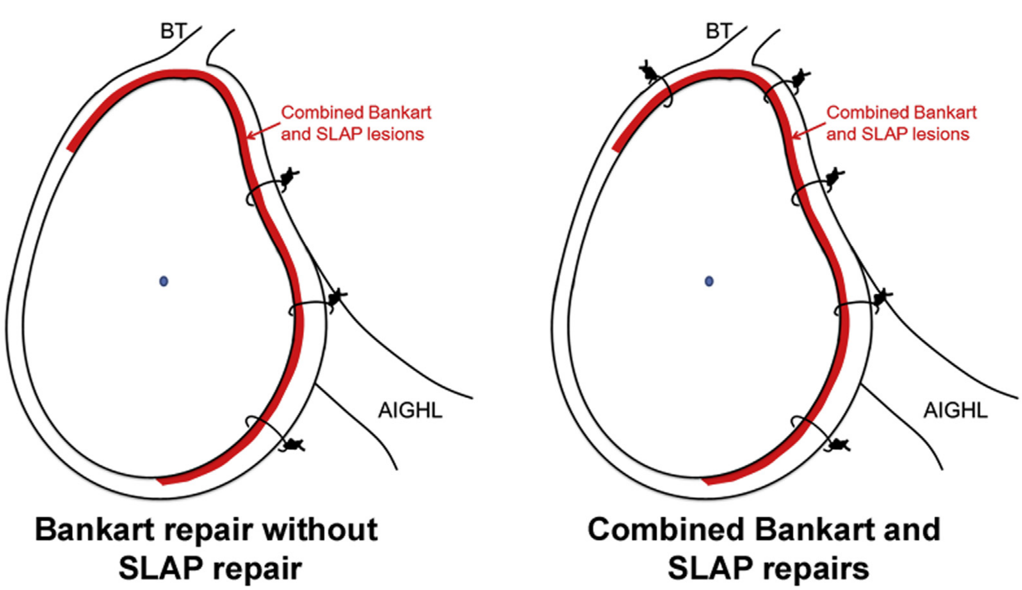

Figure 1 Surgical procedures used to repair combined Bankart and superior labral anterior-posterior (*SLAP*) lesions. *BT*, biceps tendon; *AIGHL*, anteroinferior glenohumeral ligament.

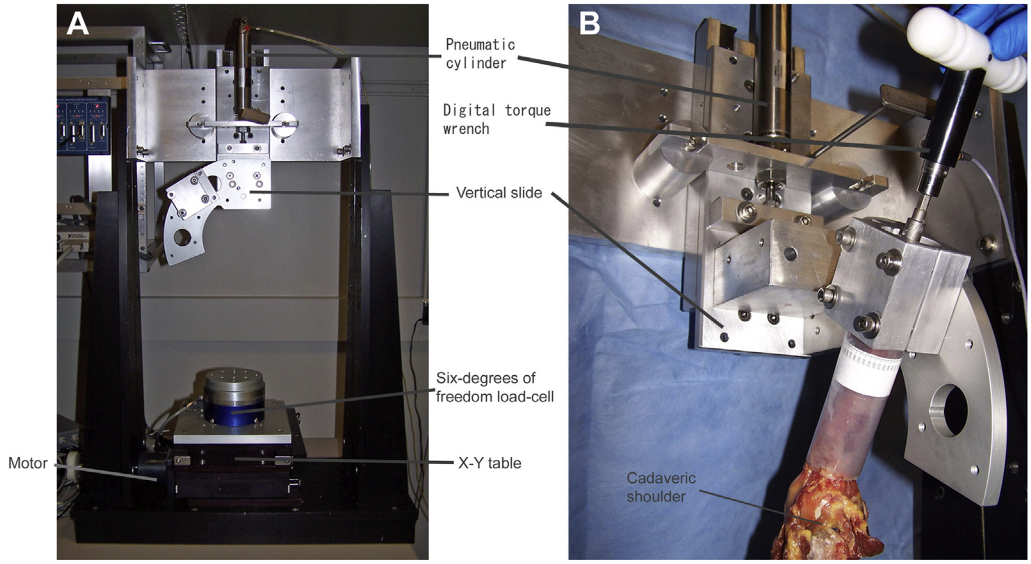

Figure 2 Measurement of joint stability. (**A**) The custom mechanical testing device had a load cell with 6 *df* that was mounted on a motorized x-y table. (**B**) The range of motion was measured using a digital torque wrench. Then, after the digital torque wrench was removed, the joint stability of the mounted cadaveric shoulder was investigated using a custom mechanical testing device.

uniaxial torque cell linked to a digital torque wrench (LCM Systems, Newport, UK), according to a previously described method.[11] The neutral orientation of the humeral shaft was determined by using the location of the bicipital groove.

Measurements of stability

The x-y table was positioned so that the relative movement of the humeral head against the glenoid was in the anterior-posterior direction. The humeral shaft was positioned at 60° of glenohumeral abduction (approximately 90° of arm abduction relative to the trunk) and the maximal external rotation angle (when a constant torque of 200 N-mm was applied). The humeral head was translated in the anterior direction for 10 mm at a rate of 2.0 mm/s. All specimens were tested with this 10-mm displacement protocol,[9,36] and only anterior stability was evaluated to avoid damaging the repaired capsule with multiple rounds of testing. Finally, the peak force at maximal translation was measured.

Statistical methods

We used the paired *t* test to determine significant differences between the combined repair and Bankart repair. $P < .05$ was considered statistically significant. Statistical analysis was performed with JMP software (version 10.0; SAS Institute, Cary, NC, USA).

Results

Range of motion

The external-rotation ranges of motion with the combined repair and Bankart repair were 39.1° (standard deviation [SD], 20.9°) and 51.8° (SD, 23.2°), respectively, at 0° of abduction and 53.3° (SD, 26.9°) and 60.6° (SD, 28.0°), respectively, at 60° of abduction. The external-rotation range of motion was significantly greater at both levels of abduction with the Bankart repair than with the combined repair (0° of abduction, $P < .01$; 60° of abduction, $P < .05$) (Fig. 3). The internal-rotation ranges of motion with the combined repair and Bankart repair were 19.4° (SD, 10.1°) and 19.6° (SD, 10.6°), respectively, at 0° of abduction and 9.4° (SD, 14.5°) and 16.7° (SD, 12.1°), respectively, at 60° of abduction. The internal-rotation range of motion between the 2 groups was not significantly different at 0° of abduction. However, the internal-rotation range of motion was significantly greater at 60° of abduction with the Bankart repair than with the combined repair ($P < .01$).

Stability test

The peak translational forces for the Bankart repair and combined repair were 82.3 N (SD, 10.9 N) and 79.1 N (SD, 14.3 N), respectively (Fig. 4). This difference was not significant ($P = .60$).

Discussion

The combined repair significantly decreased the range of motion compared with the Bankart repair alone; in addition, we observed no difference in anterior stability between the 2 repair methods. Clinically, other authors have suggested that combined Bankart and SLAP repair might be associated with a decreased range of motion.[33] Although a wide range of motion was needed for overhead throwing athletes such as baseball players,[22] the previous reports showed that it was difficult to let the patients return to their previous level of activity after SLAP repair because of a decrease in the

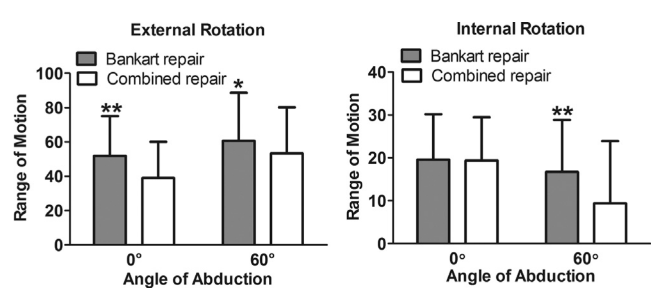

Figure 3 External- and internal-rotation ranges of motion. *Significance at $P < .05$. **Significance at $P < .01$. The *error bars* show standard deviations.

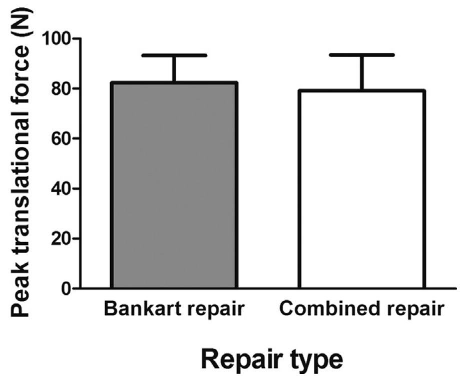

Figure 4 Stability test results. Peak translational forces did not differ between Bankart repair (ie, Bankart repair without superior labral anterior-posterior repair) and combined repair (ie, Bankart repair with superior labral anterior-posterior repair). The *error bars* show standard deviations.

range of motion.[12,30] If a patient with combined Bankart and SLAP lesions were an overhead throwing athlete, a Bankart repair alone might be preferable to avoid the decreased range of motion.

In this study, the difference in joint stability between the Bankart repair and combined repair was not significant. Several biomechanical studies have evaluated joint stability after SLAP repair.[24-26,29] Mihata et al[26] reported that type II SLAP repair did not restore anterior shoulder stability at 60° of glenohumeral abduction. Excessive humeral external rotation can cause a type II SLAP lesion[5] and anterior capsular elongation,[25] which can result in shoulder instability.[26] In our study, SLAP repair did not affect shoulder stability at 60° of glenohumeral abduction (90° of arm abduction relative to the trunk) at the end-range position, where the anterior shoulder can be dislocated. In this position, the anterior-inferior capsule, including the inferior glenohumeral ligament, restrains the anterior translation of the humerus,[11] and this capsule was repaired in both groups in our study. Therefore, the Bankart repair was more important and the SLAP repair was not associated with shoulder instability at the end-range position.

We noted that the SLAP repair was associated with a significant decrease in the range of motion. Anchor placement for repair is probably the most important factor to affect the range of motion. Although postoperative stiffness after SLAP repair may be multifactorial, the middle glenohumeral ligament can be tightened with repair of the anterior and superior labrum; thus, repair of a sublabral hole (a normal variant of the labrum) may be associated with a limited range of motion.[3,8,15] In addition, the SLAP lesion was fixed at the 11- and 1-o'clock positions, a common method of repair.[12] Morgan et al[27] recommended that 2 anchors be used to fix the posterosuperior labrum because fixing the anterosuperior labrum offers no biomechanical advantage. However, McCulloch et al[23] reported that fixation of the anterosuperior labrum decreased the external-rotation range of motion. On the other hand, Aydin et al,[1] retrospectively comparing the clinical results of isolated Bankart repair vs. combined Bankart and SLAP repair, reported that there were no significant differences in the recurrence rate and the range of motion. Further studies are needed to determine a relationship between the suture anchor placement and stiffness.

Our study has some limitations. First, because we had little information about the medical history or any symptoms of the patients from whom the cadaveric shoulders were obtained, the shoulders may not have been completely healthy, although macroscopic and radiologic examinations did not identify any abnormalities. Second, cadaveric fixed-scapula models may not fully capture the dynamic forces exerted on the glenohumeral joint through the rotator cuff and scapular positions; however, they facilitate standardization of testing and limit the number of variables tested.[17] Instead of muscle force, a compression force of 50 N was applied. According to previous cadaveric studies, 50 N of compression force is sufficient to measure glenohumeral translation in cadaveric shoulders.[9-11,19,36] Third, the combined Bankart and SLAP lesions were created experimentally on cadaveric shoulders. Although the anterior capsule and labrum were clinically elongated after dislocation of the shoulder joint, the cadavers had an intact labrum and capsule. However, obtaining a group of cadaveric shoulders with anterior instability was not possible. Fourth, all specimens were tested for stability by translating the humeral head by 10 mm. This translation value was selected to avoid damaging the soft tissues around the shoulder. Fifth, we used a transosseous suture technique for the labral repair, whereas most surgeons commonly use suture anchors.[6,28,31,33,34] We used the transosseous technique because we had to perform surgical procedures twice (Bankart repair and combined repair) and assess outcomes twice for each specimen. The range of motion and stability in this setting may not be the same as what would occur under typical clinical conditions. Sixth, we did not measure the range of motion and stability before the Bankart lesion or Bankart and SLAP lesions were made; therefore, they could not be compared with those in normal shoulders.

Conclusion

Although there was no difference in anterior stability between the Bankart repair group and the combined repair group at the end range, the Bankart repair group had a significantly greater range of motion than the combined repair group. For patients with combined Bankart and SLAP lesions and the need for a wide range of motion, a Bankart repair alone may provide greater range of motion without compromising the joint stability at the end range compared with a combined repair.

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References

1. Aydin N, Unal MB, Asansu M, Tok O. Concomitant SLAP repair does not influence the surgical outcome for arthroscopic Bankart repair of traumatic shoulder dislocations. J Orthop Surg (Hong Kong) 2017;25: 2309499017718952. https://doi.org/10.1177/2309499017718952.
2. Baker CL III, Romeo AA. Combined arthroscopic repair of a type IV SLAP tear and Bankart lesion. Arthroscopy 2009;25:1045–50. https://doi.org/10.1016/j.arthro.2009.04.075.
3. Branch TP, Lawton RL, Iobst CA, Hutton WC. The role of glenohumeral capsular ligaments in internal and external rotation of the humerus. Am J Sports Med 1995;23:632–7.
4. Burkart AC, Debski RE. Anatomy and function of the glenohumeral ligaments in anterior shoulder instability. Clin Orthop Relat Res 2002:32–9. https://doi.org/10.1097/00003086-200207000-00005.
5. Burkhart SS, Morgan CD. The peel-back mechanism: its role in producing and extending posterior type II SLAP lesions and its effect on SLAP repair rehabilitation. Arthroscopy 1998;14:637–40.
6. Cho HL, Lee CK, Hwang TH, Suh KT, Park JW. Arthroscopic repair of combined Bankart and SLAP lesions: operative techniques and clinical results. Clin Orthop Surg 2010;2:39–46. https://doi.org/10.4055/cios.2010.2.1.39.

7. Hantes ME, Venouziou AI, Liantsis AK, Dailiana ZH, Malizos KN. Arthroscopic repair for chronic anterior shoulder instability: a comparative study between patients with Bankart lesions and patients with combined Bankart and superior labral anterior posterior lesions. Am J Sports Med 2009;37:1093–8. https://doi.org/10.1177/0363546508331139.
8. Huri G, Hyun YS, Garbis NG, McFarland EG. Treatment of superior labrum anterior posterior lesions: a literature review. Acta Orthop Traumatol Turc 2014;48:290–7. https://doi.org/10.3944/AOTT.2014.3169.
9. Itoi E, Lee SB, Berglund LJ, Berge LL, An KN. The effect of a glenoid defect on anteroinferior stability of the shoulder after Bankart repair: a cadaveric study. J Bone Joint Surg Am 2000;82:35–46.
10. Itoigawa Y, Hooke AW, Sperling JW, Steinmann SP, Zhao KD, Yamamoto N, et al. Repairing the capsule to the transferred coracoid preserves external rotation in the modified Latarjet procedure. J Bone Joint Surg Am 2016;98:1484–9. https://doi.org/10.2106/JBJS.15.01069.
11. Itoigawa Y, Itoi E. Anatomy of the capsulolabral complex and rotator interval related to glenohumeral instability. Knee Surg Sports Traumatol Arthrosc 2016;24:343–9. https://doi.org/10.1007/s00167-015-3892-1.
12. Kibler WB, Sciascia A. Current practice for the surgical treatment of SLAP lesions: a systematic review. Arthroscopy 2016;32:669–83. https://doi.org/10.1016/j.arthro.2015.08.041.
13. Kim DS, Yi CH, Yoon YS. Arthroscopic repair for combined Bankart and superior labral anterior posterior lesions: a comparative study between primary and recurrent anterior dislocation in the shoulder. Int Orthop 2011;35:1187–95. https://doi.org/10.1007/s00264-011-1229-3.
14. Kim TK, Queale WS, Cosgarea AJ, McFarland EG. Clinical features of the different types of SLAP lesions: an analysis of one hundred and thirty-nine cases. J Bone Joint Surg Am 2003;85:66–71.
15. Kuhn JE, Huston LJ, Soslowsky LJ, Shyr Y, Blasier RB. External rotation of the glenohumeral joint: ligament restraints and muscle effects in the neutral and abducted positions. J Shoulder Elbow Surg 2005;14:39S–48S. https://doi.org/10.1016/j.jse.2004.09.016.
16. Lazarus MD, Sidles JA, Harryman DT II, Matsen FA III. Effect of a chondral-labral defect on glenoid concavity and glenohumeral stability. A cadaveric model. J Bone Joint Surg Am 1996;78:94–102.
17. Limpisvasti O, Yang BY, Hosseinzadeh P, Leba T-B, Tibone JE, Lee TQ. The effect of glenohumeral position on the shoulder after traumatic anterior dislocation. Am J Sports Med 2008;36:775–80. https://doi.org/10.1177/0363546507312163.
18. Lintner SA, Speer KP. Traumatic anterior glenohumeral instability: the role of arthroscopy. J Am Acad Orthop Surg 1997;5:233–9.
19. Lippitt SB, Vanderhooft JE, Harris SL, Sidles JA, Harryman DT II, Matsen FA III. Glenohumeral stability from concavity-compression: a quantitative analysis. J Shoulder Elbow Surg 1993;2:27–35.
20. Lo IK, Burkhart SS. Triple labral lesions: pathology and surgical repair technique-report of seven cases. Arthroscopy 2005;21:186–93. https://doi.org/10.1016/j.arthro.2004.09.022.
21. Maffet MW, Gartsman GM, Moseley B. Superior labrum-biceps tendon complex lesions of the shoulder. Am J Sports Med 1995;23:93–8.
22. Manske R, Ellenbecker T. Current concepts in shoulder examination of the overhead athlete. Int J Sports Phys Ther 2013;8:554–78.
23. McCulloch PC, Andrews WJ, Alexander J, Brekke A, Duwani S, Noble P. The effect on external rotation of an anchor placed anterior to the biceps in type 2 SLAP repairs in a cadaveric throwing model. Arthroscopy 2013;29:18–24. https://doi.org/10.1016/j.arthro.2012.06.021.
24. McMahon PJ, Burkart A, Musahl V, Debski RE. Glenohumeral translations are increased after a type II superior labrum anterior-posterior lesion: a cadaveric study of severity of passive stabilizer injury. J Shoulder Elbow Surg 2004;13:39–44. https://doi.org/10.1016/S1058274603002477.
25. Mihata T, Lee Y, McGarry MH, Abe M, Lee TQ. Excessive humeral external rotation results in increased shoulder laxity. Am J Sports Med 2004;32:1278–85. https://doi.org/10.1177/0363546503262188.
26. Mihata T, McGarry MH, Tibone JE, Fitzpatrick MJ, Kinoshita M, Lee TQ. Biomechanical assessment of type II superior labral anterior-posterior (SLAP) lesions associated with anterior shoulder capsular laxity as seen in throwers: a cadaveric study. Am J Sports Med 2008;36:1604–10. https://doi.org/10.1177/0363546508315198.
27. Morgan RJ, Kuremsky MA, Peindl RD, Fleischli JE. A biomechanical comparison of two suture anchor configurations for the repair of type II SLAP lesions subjected to a peel-back mechanism of failure. Arthroscopy 2008;24:383–8. https://doi.org/10.1016/j.arthro.2007.09.014.
28. Ozbaydar MU, Tekin C, Kocabas R, Altun M. [Arthroscopic repair of combined superior labrum anterior posterior and Bankart lesions]. Acta Orthop Traumatol Turc 2006;40:134–9 (in Turkish).
29. Panossian VR, Mihata T, Tibone JE, Fitzpatrick MJ, McGarry MH, Lee TQ. Biomechanical analysis of isolated type II SLAP lesions and repair. J Shoulder Elbow Surg 2005;14:529–34. https://doi.org/10.1016/j.jse.2004.11.002.
30. Provencher MT, McCormick F, Dewing C, McIntire S, Solomon D. A prospective analysis of 179 type 2 superior labrum anterior and posterior repairs: outcomes and factors associated with success and failure. Am J Sports Med 2013;41:880–6. https://doi.org/10.1177/0363546513477363.
31. Sayde WM, Cohen SB, Ciccotti MG, Dodson CC. Return to play after type II superior labral anterior-posterior lesion repairs in athletes: a systematic review. Clin Orthop Relat Res 2012;470:1595–600. https://doi.org/10.1007/s11999-012-2295-6.
32. Snyder SJ, Karzel RP, Del Pizzo W, Ferkel RD, Friedman MJ. SLAP lesions of the shoulder. Arthroscopy 1990;6:274–9.
33. Takase K. Risk of motion loss with combined Bankart and SLAP repairs. Orthopedics 2009;32. https://doi.org/10.3928/01477447-20090624-05.
34. Warner JJ, Kann S, Marks P. Arthroscopic repair of combined Bankart and superior labral detachment anterior and posterior lesions: technique and preliminary results. Arthroscopy 1994;10:383–91.
35. Yamamoto N, Muraki T, An KN, Sperling JW, Cofield RH, Itoi E, et al. The stabilizing mechanism of the Latarjet procedure: a cadaveric study. J Bone Joint Surg Am 2013;95:1390–7. https://doi.org/10.2106/JBJS.L.00777.
36. Yamamoto N, Muraki T, Sperling JW, Steinmann SP, Cofield RH, Itoi E, et al. Stabilizing mechanism in bone-grafting of a large glenoid defect. J Bone Joint Surg Am 2010;92:2059–66. https://doi.org/10.2106/JBJS.I.00261.
37. Yiannakopoulos CK, Mataragas E, Antonogiannakis E. A comparison of the spectrum of intra-articular lesions in acute and chronic anterior shoulder instability. Arthroscopy 2007;23:985–90. https://doi.org/10.1016/j.arthro.2007.05.009.