

# A Comparison between Arthroscopic Biceps Tenodesis and Arthroscopic Repair in Isolated Type 2 Superior Labrum Anterior and Posterior Lesions

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**Background:** The purpose of this study was to compare the clinical outcome in patients aged less than 55 years who underwent arthroscopic tenodesis and arthroscopic repair for type 2 superior labrum anterior and posterior (SLAP) lesions.

**Methods:** Between April 2008 and December 2014, surgery was performed on a total of 45 patients with isolated type 2 SLAP lesions. Arthroscopic repair was performed in 22 patients and arthroscopic tenodesis was performed in 23 patients. In both groups, the clinical outcomes at follow-ups were evaluated using the University of California at Los Angeles (UCLA) score, American Shoulder and Elbow Surgeons (ASES) score, and visual analogue scale (VAS) score.

**Results:** In both groups, the VAS scores for pain had improved significantly throughout the postoperative follow-up period. The VAS score showed a statistically significant difference at postoperative 3 and 6 months ( $p < 0.05$ ); however, there was no statistically significant difference between preoperative and postoperative results at 12 months ( $p > 0.05$ ). In both groups, the functional outcome was statistically improved postoperatively. In a comparison of the UCLA and ASES scores between the two groups, there was a statistically significant difference at postoperative 3 and 6 months ( $p < 0.05$ ), but there was no statistically significant difference between preoperative and postoperative results at 12 months ( $p > 0.05$ ).

**Conclusions:** Based on the results of this and other studies, patients with isolated type 2 SLAP lesions showed better short-term clinical outcome with tenodesis than with repair. However, there was no difference between the two groups at the final follow-up.

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**Key Words:** Type 2 superior labrum anterior and posterior; Biceps tenodesis; Repair; Shoulder

## Introduction

The superior labrum anterior and posterior (SLAP) lesion was first described by Andrews et al.<sup>1)</sup> in a throwing athlete and was classified into four types by Snyder et al.<sup>2)</sup> In a type 2 SLAP lesion, which is the most common type, the superior portion of the glenoid labrum and tendon of the biceps brachii muscle separate from the glenoid rim.<sup>3)</sup>

The treatment for this is controversial. Although arthroscopic repair has been considered the standard treatment,<sup>4,5)</sup> the report-

ed degree of satisfaction and return to daily life after arthroscopic repair have been inconsistent.<sup>6-8)</sup> Moreover, prolonged postoperative stiffness and the need for rehabilitation have been reported.<sup>9,10)</sup> A recent study suggested that arthroscopic SLAP repair is ideal for patients under the age of 40 years, encouraging arthroscopic biceps tenodesis or tenotomy for older patients.<sup>11,12)</sup>

The purpose of this study was to compare the clinical outcomes in patients aged less than 55 years who underwent arthroscopic tenodesis or arthroscopic repair for type 2 SLAP lesions.

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We hypothesized that there would be no difference in clinical outcomes between the two groups.

## Methods

### Study Population

Between April 2008 and December 2014, there was a total of 56 patients with type 2 SLAP lesions who underwent surgery; among them, 45 patients were followed-up for over 12 months. These patients had isolated type 2 SLAP lesions, and the average follow-up period was 15.4 months.

A diagnosis was based on the clinical presentation, physical examination, and radiologic findings. Patients were evaluated for SLAP lesions using the active compression test and anterior apprehension tests. All patients underwent preoperative plain X-ray and magnetic resonance imaging. A radiological diagnosis confirmed the clinical suspicion due to a contrast between the surface of the superior labrum and glenoid rim. During the arthroscopic surgery, we confirmed SLAP lesion by finding a superior labral detachment at greater than 5 mm from the glenoid rim.

Cases with rotator cuff tear, glenohumeral arthritis, calcific tendinitis, spinoglenoid notch cyst, revision SLAP lesion, or partial tear of the subscapularis tendon were excluded from the study.

Patients who underwent arthroscopic repair were classified into the repair group, and patients who underwent arthroscopic biceps tenodesis were categorized into the tenodesis group. The repair group comprised of 18 males and 4 females, and the average age was 41.7 years (22–52 years). The tenodesis group comprised of 17 males and 6 females, and the average age was 48.3 years (35–54 years). A comparison between the two groups is shown in Table 1.

### Surgical Technique

The decision to perform repair versus tenodesis was based on age, activity level, and worker's compensation status. Patients aged less than 35 years underwent SLAP repair; those aged over 35 years underwent tenotomy—depending on the extent of impairment of daily life and sports activities—or tenodesis if they performed strenuous work. SLAP repair was performed when there was no synovitis or tendinitis around the biceps tendon

and when less than a 20% biceps tendon partial tear was discovered during the arthroscopic surgery. A partial tear of the biceps tendon was determined by measuring the diameter and extent of the tear using a probe that calculated the tear as a percentage. Tenodesis was performed in the following circumstances: When synovitis was severe, when tendinitis was present, or when there was a greater than 20% partial tear of the biceps tendon. For a mild fraying of the subscapularis tendon, debridement was performed.

### Repair

Arthroscopic surgery was performed by a single experienced shoulder surgeon (10 years of arthroscopic surgery in about 150 cases). After examination under general anesthesia, the patient was placed in a semi-sitting, beach-chair position. A standard posterior portal was placed, and a diagnostic arthroscopy was performed. Additional portals were situated at the anterosuperior and anteroinferior locations when needed. A special evaluation form was used to record and assess all findings. The findings were categorized into anteroinferior labral, capsular, SLAP, bony structure, and rotator cuff lesions.

To repair the labral lesions, the superior glenoid was debrided to the bleeding bone using a shaver or burr (Arthrex, Naples, FL, USA) and rasp. Absorbable 3.0 Bio-SutureTak (Arthrex) was used. The Concept Shuttle Relay system (Conmed Linvatec, Largo, FL, USA) was also used in creating a suture passage. The torn labrum was placed in its previous anatomical location for restoration. Depending on the size of the lesion and its posterior or anterior extension, 1 to 3 anchors were inserted through the anterosuperior portal. The average number of anchors was 2.2 (Fig. 1).

### Tenodesis

Tenodesis was first performed in the same manner as the diagnostic arthroscopic repair. The presence of an intraarticular labrum abnormality or lesion of the long head of the biceps tendon was assessed, and the long head was cut if a lesion was discovered. To perform subsequent tendon fixation, traction was loosened, with the arms positioned in abduction and internal rotation with the elbow positioned at 90 degrees of flexion. Then, an incision was made 2 to 3 cm down to the pectoralis muscle in the axilla for cosmesis, while palpating the lower boundary of the pectoralis muscle. Tendon fixation was performed at the musculotendinous junction of the biceps located 1 cm proximal from the lower boundary of the pectoralis muscle. For tenodesis, absorbable 3.0 Bio-SutureTak was used. Only 1 anchor was inserted (Fig. 2).

### Rehabilitation

Postoperative rehabilitation that included intermittent passive shoulder movement, while wearing a 20-degree abduction

Table 1. Patient Demographic

Variable	Repair group	Tenodesis group	p-value
Sex (male/female)	18/4	17/6	0.485
Mean age (yr)	41.7 (22–52)	48.3 (35–54)	0.054
Mean follow-up (mo)	14.4	16.3	0.067

Values are presented as number only, mean (range), or mean only.

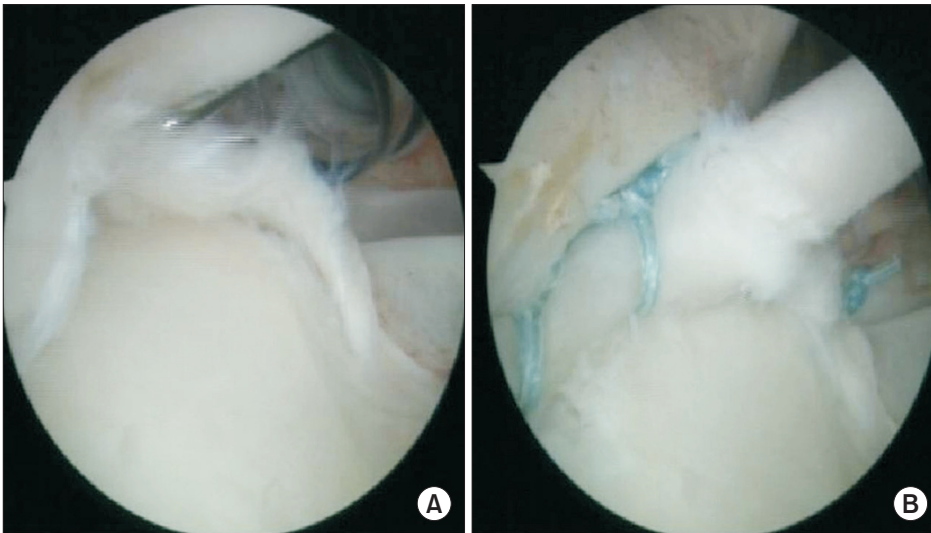


Fig. 1. (A) Isolated type 2 superior labrum anterior and posterior (SLAP) tear with partial biceps tendon tear. (B) Arthroscopic SLAP lesion repair with suture anchors.

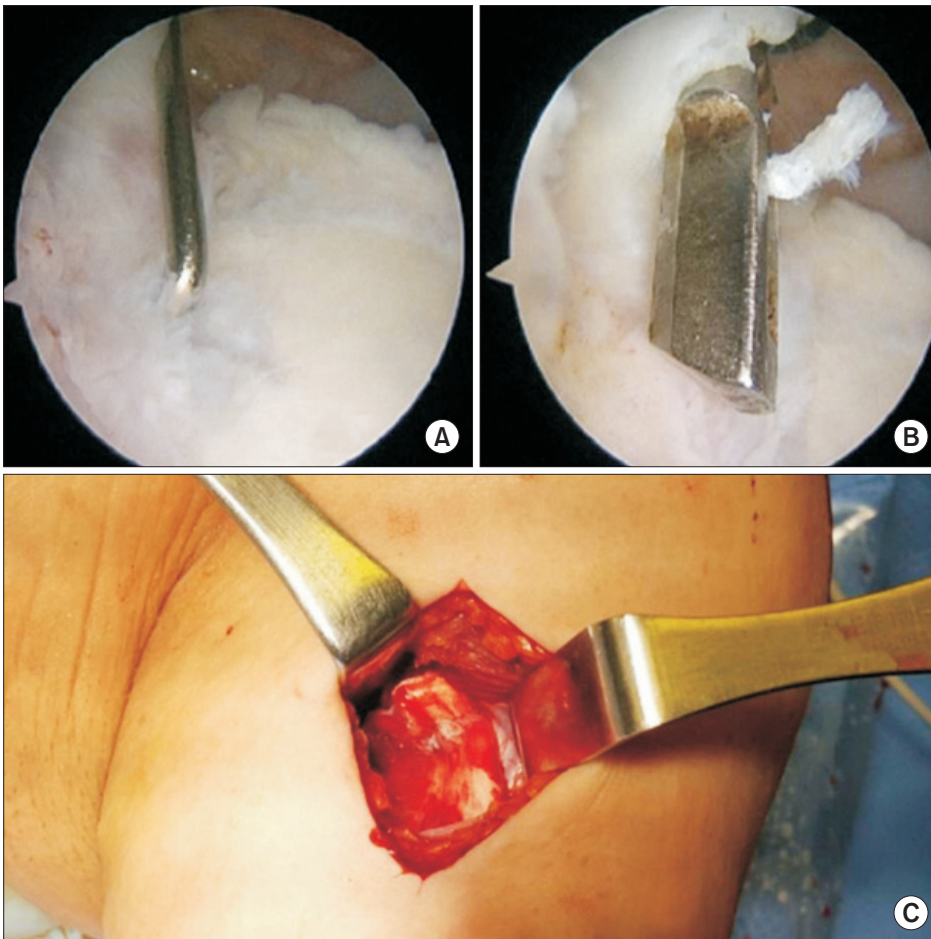


Fig. 2. Isolated type 2 superior labrum anterior and posterior (SLAP) tear (A) and arthroscopic tenotomy (B). (C) Open tenodesis with suture anchor.

brace, was performed in both groups for 3 weeks after the surgery, beginning on the day after surgery. From week 3 to week 6, the brace was removed, and passive movement and intermittent active exercises of the shoulder were performed. The intensity of active shoulder exercise using bands and dumbbells was in-

creased at postoperative 6 weeks; however, strenuous exercise was not permitted for 3 months.

### Clinical Evaluation and Statistical Analysis

After surgery, subjective pain was measured with the visual

analogue scale (VAS) score, and clinical evaluation was performed with pre- and postoperative use of the American Shoulder and Elbow Surgeons (ASES) score and University of California at Los Angeles (UCLA) score. Assessments were performed 4 times: before surgery, as well as 3, 6, and 12 months after surgery. Statistical analysis was performed with the paired t-test for the difference between pre- and postoperative pain scores and functional outcomes in the 2 groups. SPSS Statistics ver. 12.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. The statistical significance level was  $p < 0.05$ .

## Results

### Pain

In both groups, there was a significant improvement postoperatively with respect to the VAS score for pain. By the evaluation period, the preoperative VAS score in the repair group was 6; the postoperative VAS score was 4.8 at 3 months, 3.1 at 6 months, and 1.3 at 12 months ( $p < 0.05$ ). In the tenodesis group, preoperative VAS score was 6.7, and the postoperative VAS score was 2.8 at 3 months, 2.2 at 6 months, and 1.8 at 12 months ( $p < 0.05$ ) (Fig. 3).

The VAS score showed a statistically significant difference at 3 and 6 months postoperatively ( $p < 0.05$ ); however, there was no statistically significant difference between the preoperative and postoperative 12 months VAS scores ( $p = 0.448$ ).

### Functional Outcome

In both groups, the functional outcome had statistically improved postoperatively. The mean preoperative UCLA score in the repair group was 16.3, and the postoperative score was 24.6 at 3 months, 30.1 at 6 months, and 35.2 at 12 months ( $p < 0.001$ ). The mean preoperative UCLA score in the tenodesis group was 16.0 points, and the postoperative score was 32.5 at

3 months, 36.3 at 6 months, and 37.2 at 12 months ( $p < 0.001$ ) (Fig. 4).

The mean preoperative ASES score in the repair group was 35.3 (18–46), and the postoperative score was 46.1 at 3 months, 72.4 at 6 months, and 83.1 at 12 months ( $p < 0.001$ ). The mean preoperative ASES score in the tenodesis group was 36.5, and the postoperative score was 78.1 at 3 months, 82.3 at 6 months, and 88.9 points at 12 months ( $p < 0.001$ ) (Fig. 5).

In a comparison of the UCLA and ASES scores between the two groups, there was a statistically significant difference at 3 and 6 months postoperatively ( $p < 0.05$ ), but no statistically significant difference between preoperative and postoperative results at 12 months ( $p = 0.388$ ).

There were no postoperative infections or failures of fixation at the final follow-up. There were no patients with increased postoperative pain or decreased shoulder mobility. Moreover, no patients complained of axillary bulging.

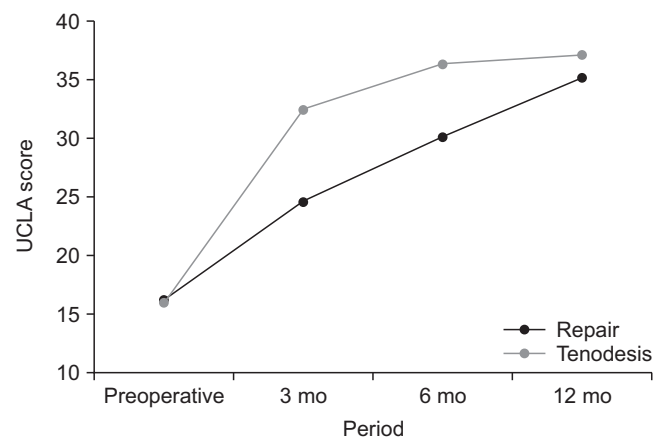


Fig. 4. University of California at Los Angeles (UCLA) score in repair group and tenodesis group by period.

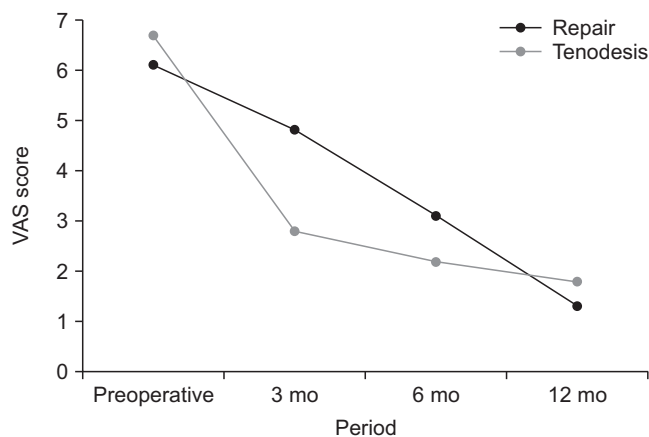


Fig. 3. Visual analogue scale (VAS) score in repair group and tenodesis group by period.

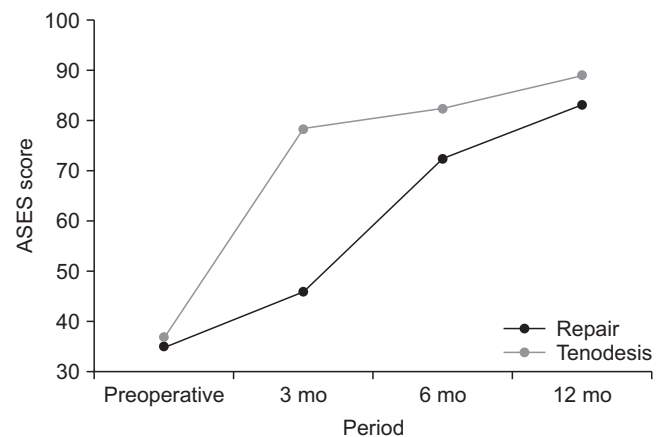


Fig. 5. American Shoulder and Elbow Surgeons (ASES) score in repair group and tenodesis group by period.

## Discussion

Based on our results, patients with isolated type 2 SLAP lesions have better short-term clinical outcomes from undergoing tenodesis than repair. However, there was no difference between the two groups at the final follow-up.

Type 2 is the most common SLAP lesion, but the treatment for it remains controversial, especially depending on the age and the level of activity of patients.

Kartus et al.<sup>13)</sup> performed arthroscopic repair and tenodesis in patients with type 2 SLAP, showing good clinical results in both groups with respect to pain and function at postoperative 12 months. Brockmeyer et al.<sup>12)</sup> recommended arthroscopic repair for patients with type 2 SLAP lesions who were active and aged less than 40 years. In patients over 40 years with degenerative change of the biceps tendon and rotator cuff tears, biceps tenotomy and tenodesis were recommended.

However, these studies did not compare the clinical outcomes in patients with isolated type 2 SLAP lesions. Moreover, they included patients with rotator cuff injuries, which were excluded in our study.

In determining whether to use arthroscopic repair or tenodesis in patients with isolated type 2 SLAP lesions, we determined that arthroscopic repair would be more suitable when the tear size is small or when there are no symptoms of synovitis. However, tenodesis is preferred when there was severe synovitis around the biceps tendon and when tendinitis was discovered during the arthroscopic surgery.

Boileau et al.<sup>8)</sup> and Neri et al.<sup>14)</sup> reported inadequate results in overhead-throwing athletes, as many patients could not achieve their preoperative activity level after surgery. The authors reported significantly better results and a higher rate of return to pre-injury sports activity levels with tenodesis, after comparing the results of SLAP repair and tenodesis in overhead-throwing athletes.<sup>8)</sup>

Alpert et al.<sup>15)</sup> and Provencher et al.<sup>16)</sup> recommended biceps tenotomy and tenodesis as an alternative in patients aged over 40 years because SLAP repair resulted in a higher rate of postoperative pain and shoulder stiffness.

The results of tenodesis and repair were directly compared in all studies mentioned above; and all showed better results with tenodesis, which is similar to our study results. However, direct comparisons with other studies were difficult because our study only evaluated patients with isolated type 2 SLAP lesions.

In this study, both the repair and tenodesis groups achieved better results in the VAS, UCLA, and ASES scores at 12 months. However, according to the study by Alpert et al.,<sup>15)</sup> there was faster improvement in postoperative pain and functional scores from undergoing tenodesis than from undergoing arthroscopic repair. Therefore, the authors anticipated better short-term clinical outcomes with tenodesis than with repair.

There were several limitations to consider when interpreting our results. This study evaluated only a small number of patients, and the follow-up period was relatively short. The retrospective patient group selection was also a limitation. Moreover, the use of arthroscopic repair or tenodesis was partly determined by the presence of synovitis around the biceps tendon, as well as the extent of tendinitis and degree of partial tear. Moreover, the conditions for each case varied, possibly affecting the clinical outcomes. However, the treatment of isolated type 2 SLAP lesions was a strength of this study.

## Conclusion

Based on the results of this and other aforementioned studies, we can conclude that patients with isolated type 2 SLAP lesions have better short-term clinical outcomes with tenodesis than with repair. However, there was no difference between the two groups at the final follow-up.

## References

1. Andrews JR, Carson WG Jr, McLeod WD. Glenoid labrum tears related to the long head of the biceps. *Am J Sports Med.* 1985;13(5):337-41.
2. Snyder SJ, Banas MP, Karzel RP. An analysis of 140 injuries to the superior glenoid labrum. *J Shoulder Elbow Surg.* 1995;4(4):243-8.
3. Snyder SJ, Karzel RP, Del Pizzo W, Ferkel RD, Friedman MJ. SLAP lesions of the shoulder. *Arthroscopy.* 1990;6(4):274-9.
4. Ide J, Maeda S, Takagi K. Sports activity after arthroscopic superior labral repair using suture anchors in overhead-throwing athletes. *Am J Sports Med.* 2005;33(4):507-14.
5. Kim SH, Ha KI, Kim SH, Choi HJ. Results of arthroscopic treatment of superior labral lesions. *J Bone Joint Surg Am.* 2002;84(6):981-5.
6. Gorantla K, Gill C, Wright RW. The outcome of type II SLAP repair: a systematic review. *Arthroscopy.* 2010;26(4):537-45.
7. Katz LM, Hsu S, Miller SL, et al. Poor outcomes after SLAP repair: descriptive analysis and prognosis. *Arthroscopy.* 2009;25(8):849-55.
8. Boileau P, Parratte S, Chuinard C, Roussanne Y, Shia D, Bicknell R. Arthroscopic treatment of isolated type II SLAP lesions: biceps tenodesis as an alternative to reinsertion. *Am J Sports Med.* 2009;37(5):929-36.
9. Brockmeier SF, Voos JE, Williams RJ 3rd, Altchek DW, Cordasco FA, Allen AA; Hospital for Special Surgery Sports Medicine and Shoulder Service. Outcomes after arthroscopic repair of type-II SLAP lesions. *J Bone Joint Surg Am.* 2009;91(7):1595-603.
10. Cohen DB, Coleman S, Drakos MC, et al. Outcomes of isolated type II SLAP lesions treated with arthroscopic fixation using

- a bioabsorbable tack. *Arthroscopy*. 2006;22(2):136-42.
11. Denard PJ, Lädermann A, Parsley BK, Burkhart SS. Arthroscopic biceps tenodesis compared with repair of isolated type II SLAP lesions in patients older than 35 years. *Orthopedics*. 2014;37(3):e292-7.
  12. Brockmeyer M, Tompkins M, Kohn DM, Lorbach O. SLAP lesions: a treatment algorithm. *Knee Surg Sports Traumatol Arthrosc*. 2016;24(2):447-55.
  13. Kartus J, Kartus C, Brownlow H, Burrow G, Perko M. Repair of type-2 SLAP lesions using Corkscrew anchors. A preliminary report of the clinical results. *Knee Surg Sports Traumatol Arthrosc*. 2004;12(3):229-34.
  14. Neri BR, ElAttrache NS, Owsley KC, Mohr K, Yocum LA. Outcome of type II superior labral anterior posterior repairs in elite overhead athletes: effect of concomitant partial-thickness rotator cuff tears. *Am J Sports Med*. 2011;39(1):114-20.
  15. Alpert JM, Wuerz TH, O'Donnell TF, Carroll KM, Brucker NN, Gill TJ. The effect of age on the outcomes of arthroscopic repair of type II superior labral anterior and posterior lesions. *Am J Sports Med*. 2010;38(11):2299-303.
  16. 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(4):880-6.