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Isolated Type II Superior Labral Anterior Posterior Lesions

Age-Related Outcome of Arthroscopic Fixation

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Background: Superior labral anterior posterior tears have been described as symptomatic lesions in shoulders of patients of varying ages. It is unknown if age affects clinical outcome of arthroscopic fixation of type II superior labral anterior posterior repairs.

Hypothesis: Clinical outcome of arthroscopic fixation of isolated type II superior labral anterior posterior tears differs between younger (<40 years) and older (≥40 years) patients.

Study Design: Cohort study; Level of evidence, 3.

Methods: Clinical results of arthroscopic fixation of isolated unstable type II superior labral anterior posterior repairs were compared between 25 patients younger than 40 years (group 1) and 25 patients aged 40 years or older (group 2). Patients with concomitant procedures, prior/subsequent shoulder surgeries, and use of non–suture anchor devices were excluded. Outcomes at a minimum 1-year follow-up were assessed using range of motion measurements and the American Shoulder and Elbow Surgeons questionnaire as compared with preoperative data. Ability and time to return to prior level of activity were assessed.

Results: At a mean 3-year follow-up, there were statistically significant improvements in American Shoulder and Elbow Surgeons scores for both groups ($P < .0001$) but no significant difference between final American Shoulder and Elbow Surgeons scores (group 1, 91; group 2, 87; $P > .198$). Both groups demonstrated good or excellent results in >80% of patients. A traumatic mechanism of injury ($P = .0346$) and presence of osteoarthritis ($P = .0401$) were independent factors resulting in significantly lower postoperative scores. There were statistically significant differences in preoperative and postoperative range of motion for internal rotation (group 1, $P = .0321$) and forward elevation (group 2, $P = .0003$). Return to prior level of activity was similar between younger and older age groups: 80% versus 74%. Time to return to sport was prolonged for group 2 (11.0 months) compared with group 1 (8.45 months). Patients without osteoarthritis were significantly more likely to return to previous levels of activity than were those who had osteoarthritis ($P = .0044$).

Conclusion: Good to excellent results and high return to prior level of activity can be expected for the majority of properly indicated patients who undergo isolated type II superior labral anterior posterior repairs, regardless of age. Subtle deficits in range of motion were experienced by both age groups; this did not seem to affect final outcomes. The presence of osteoarthritis was associated with lower American Shoulder and Elbow Surgeons scores and inability to return to prior level of activity. Time to return to activity was prolonged for the older group.

Keywords: superior labral anterior posterior (SLAP) lesion; age; arthroscopy; shoulder

Superior labral anterior posterior (SLAP) lesions are a well-described source of shoulder pain and occasional instability in varying patient populations.[2,6,8,9,13] Type II SLAP lesions are particularly unstable variants that, if they are symptomatic and fail to respond to nonoperative management, are suitable for surgical stabilization.[1] Although current arthroscopic techniques have improved outcomes in the majority of patients, there is concern regarding patient selection, specifically, which patient populations benefit most from this procedure.[4,5,12]

The clinical features of type II SLAP lesions have been found to differ with age.[8] Patients who are younger than 40 years have a higher incidence of instability, Bankart lesions,

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and participation in overhead sports. On the other hand, patients 40 years and older have a higher incidence of concomitant rotator cuff lesions and glenohumeral osteoarthritis. Whether these age-related differences affect the clinical outcome of arthroscopic repair is unknown.

Khetia et al[7] presented 21 patients with failed SLAP repairs and stated that patients older than 40 years rarely had labral lesions as a cause of pain, and at least some were better managed with tenodesis. They further cautioned that SLAP repairs in nonoverhead athletes older than 40 years need to be carefully considered, as surgical repair may lead to postoperative pain and stiffness.

The purpose of this investigation was to determine if there were any age-related differences in outcome after isolated arthroscopic type II SLAP repairs in 2 different groups: group 1, patients younger than 40 years; group 2, patients aged 40 years and older. Our hypothesis is that the clinical outcome of the arthroscopic fixation of isolated type II SLAP tears differs between younger (<40 years) and older (≥40 years) patients, with the older group experiencing more postoperative stiffness and a delayed return to activity.

MATERIALS AND METHODS

Patient Selection

After approval was obtained from our institutional review board, a study population was recruited through a retrospective review of our clinic's operative database. Patients were included in the study if they were at least 1 year postoperative from an isolated type II SLAP repair. Exclusion criteria consisted of being less than 1 year from surgery, concomitant procedures (ie, subacromial decompression, distal clavicle resection, rotator cuff repair, capsulolabral repair for instability), subsequent surgeries on the ipsilateral shoulder, and use of non–suture anchor devices. Between January 2002 and May 2007, 214 patients were identified who had undergone isolated type II SLAP repair. Of these, 72 patients met the inclusion criteria, of which 50 patients (70%) returned for clinical examination and questionnaire. The remaining 22 patients, consisting of 13 older patients (mean age, 45.2 years; mean follow-up, 44.8 months) and 9 younger patients (mean age, 21.0 years; mean follow-up, 38.2 months) with similar demographic data as those included in the study, were either unable to be contacted by phone/mail or could not fully participate in the study. Twenty-five patients younger than 40 years made up group 1, and the remaining 25 patients 40 years or older were in group 2. The patients' electronic medical records were reviewed to retrieve preoperative data, including pertinent history, range of motion, and American Shoulder and Elbow Surgeons (ASES) scores.

Diagnosis

The diagnosis of a SLAP tear was made in all patients using a combination of their clinical history, physical examination, and radiologic studies. The physical examination included the use of the active compression test in combination with information gained from anterior apprehension and relocation testing. All patients underwent preoperative plain radiographs (anteroposterior, outlet, and axillary views) and MRI with intra-articular gadolinium before surgery. The radiographic findings consistent with a SLAP tear included the presence of contrast dye between the undersurface of the superior labrum and superior glenoid rim, in excess of what is typically seen with a sublabral recess or normal anatomical variant. Regarding concomitant preoperative diagnoses, 4 patients (group 2) had glenohumeral osteoarthritis, and 2 patients (1, group 1; 1, group 2) had bursitis identified on MRI evaluation. Final confirmation of type II SLAP tears was made at the time of arthroscopic surgery with >5-mm detachment of the superior labrum/biceps anchor from the glenoid rim. In most cases, this was accompanied by varying degrees of superior glenoid wear beneath the detached labral tissue. Before any surgical intervention, 48 of 50 (96%) patients underwent at least 2 months of supervised physical therapy and were prescribed anti-inflammatory medication. No corticosteroid injections were used in the preoperative management.

Surgical Technique

All patients were placed in the lateral decubitus position with a beanbag flotation device. The arm was placed in an Acufex shoulder arthroscopic suspension apparatus (Acufex, Norwood, Massachusetts) with 10 lb of traction. A standard posterior arthroscopic viewing portal was established 2 cm inferior and 1 cm medial to the posterolateral edge of the acromion. A routine diagnostic arthroscopy was performed noting any glenohumeral changes, concomitant labral lesions, and rotator cuff lesions. Debridement was performed as indicated in cases with partial-thickness rotator cuff tears and/or osteoarthritic lesions. Accessory anterior and midlateral arthroscopic portals were created as needed for instrumentation. For labral lesions detached anterior to the biceps anchor, anterosuperior and anteroinferior portals were established through the interval tissue using an outside-to-inside technique. For posteriorly extending lesions, a trans–rotator cuff portal was established medial to the cable at the junction of the supraspinatus and infraspinatus tendons. The superior glenoid rim was debrided to bleeding bone using a shaver, bur, or rasp. Bioabsorbable suture anchors (Bio-SutureTaks, Arthrex, Naples, Florida) loaded with No. 2 nonabsorbable sutures were placed along the superior glenoid rim. The sutures were passed through the labrum and biceps anchor using a suture lasso (Arthrex), and sliding self-locking knots backed by alternating half-hitches were used to secure the soft tissues firmly to bone.

Postoperative Protocol

All patients in this study followed a standard postoperative protocol for superior labral repairs that has been well established at our clinic. Patients were initially placed in a shoulder immobilizer for 7 to 10 days. Elbow and wrist

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TABLE 1
Preoperative Data

	Group 1: <40 Years	Group 2: ≥40 Years
No. of patients	25	25
Mean age, y (range)	23.0 (19-38)	47.0 (40-55)
Mean follow-up, mo (range)	36.4 (12-70)	40.5 (12-81)
Gender (%)		
Male	25 (100)	24 (96)
Female	0	1 (4)
Arm dominance (%)	23/25 (92)	14/25 (56)
Mechanism (%)		
Atraumatic	19 (76)	13 (52)
Traumatic	6 (24)	12 (48)
Complaint (%)		
Pain	24 (96)	24 (96)
Weakness	12 (28)	8 (32)
Instability	5 (20)	5 (20)
Clicking	2 (8)	1 (4)
Sports participation (%)	25/25 (100)	23/25 (96)

range of motion exercises were allowed during this period. A formal supervised physical therapy program was initiated at 2 weeks with gentle pendulum exercises, passive range of motion as tolerated, and isometric strengthening exercises. Active-assisted exercises were added at 4 weeks with the goal of full range of motion by 6 to 8 weeks. Rotator cuff and periscapular strengthening using Theraband followed by progressive resistive exercises commenced at 6 weeks. Progressive strengthening continued through 12 to 16 weeks with the goal of return to all activities within 4 to 6 months.

Preoperative Data

The demographic and preoperative data are summarized in Table 1. The mean ages for groups 1 and 2 were 23.0 years (range, 19-38 years) and 47.0 years (range, 40-55 years), respectively, with mean follow-up greater than 3 years. The majority of patients were male for both groups; however, there were statistical differences with regard to arm dominance. Group 2 had significantly less dominant arms affected ($P = .0117$) and more traumatic mechanisms of injury ($P = .0771$) than did group 1. A traumatic mechanism was defined as a single episode of injury (ie, fall), as opposed to an atraumatic mechanism, typically occurring with insidious onset and/or associated with repetitive activity. Nearly all patients included in the study participated in regular athletic activity (group 1, 100%; group II, 96%), allowing us to use this as a clinical outcome measure. The level of sports participation varied from recreational to professional in baseball, football, gymnastics, water polo, golf, tennis, cycling, and surfing. Preoperative plain radiographs were unremarkable for all patients in group 1. Six patients in group 2 demonstrated moderate acromioclavicular arthrosis, and 2 patients demonstrated early glenohumeral degenerative changes on preoperative radiographs. Contrast-enhanced MRI revealed SLAP tears in all subjects.

TABLE 2
Arthroscopic Data and Findings[a]

	Group 1: <40 Years	Group 2: ≥40 Years
No. of anchors	2.3	2.0
PTRCT (%)	7/25 (28)	10/25 (40)
10%-20%	2	5
20%-30%	4	2
30%-40%	1	2
40%-50%	0	1
Glenohumeral OA (%)	0	8/25 (32%)
Grade I		1
Grade II		2
Grade III		3
Grade IV		2

[a] OA, osteoarthritis; PTRCT, partial-thickness rotator cuff tears.

Evaluation

Twenty-five patients in both group 1 and group 2 were evaluated at a mean 36.4 and 40.5 months after surgery, respectively. Patients underwent thorough clinical and physical examinations with completion of ASES questionnaires and questions regarding functional ability and time to return to athletic activity. Range of motion measurements were performed with the patient supine and the scapula stabilized with use of a handheld goniometer.

Statistical Methods

The associations between group 1 and 2 preoperative data were compared using the Fisher exact test. Mean differences between preoperative and postoperative data, including differences in ASES scores and range of motion measurements, were analyzed using the paired t test. Last, the t test was used to evaluate differences in time and ability to return to activity between groups, conditional that the patient returned to activity at final follow-up. All analyses were performed by a trained statistician using JMP statistical software, version 7 (JMP, SAS Inc, Cary, North Carolina).

RESULTS

The results of the arthroscopic findings are summarized in Table 2. All patients demonstrated isolated unstable type II SLAP tears. The number of anchors was similar for both groups ($P = .652$). There was a higher incidence of partial-thickness rotator cuff tears for group 2 (40%) as compared with group 1 (28%; $P = .37$). Glenohumeral osteoarthritis was not present in any group 1 patients but was noted in 8 of 25 (32%) patients in group 2 ($P = .004$), ranging from grade I to IV based on the Outerbridge classification.[10,11]

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TABLE 3
Comparison of Preoperative and Postoperative ASES Scores Between Groups[a]

ASES	Group 1: <40 Years	Group 2: ≥40 Years	P
Preoperative	59.04 (45-68.3)	54.56 (48-63.3)	.2161
Postoperative	91.42 (90-100)	87.16 (81.6-95)	.1980
Change	32.38 (26.7-42)	32.60 (22-39)	.0001

[a]ASES, American Shoulder and Elbow Surgeons. Parenthetical values represent interquartile (Q1-Q3) mean ranges.

TABLE 4
Comparison of Postoperative ASES Scores Between Categories[a]

Variable	Mean	P
Dominant		.0922
No	84.85 (81.60-95.0)	
Yes	91.01 (86.20-100.00)	
Traumatic		.0346
No	91.87 (85.40-99.00)	
Yes	84.70 (74.17-100.00)	
PTRCT		.4491
No	90.27 (85.80-100.00)	
Yes	87.68 (80.00-98.00)	
Osteoarthritis		.0401
No	90.75 (85.00-100.00)	
Yes	81.62 (72.88-90.40)	

[a]ASES, American Shoulder and Elbow Surgeons; PTRCT, partial-thickness rotator cuff tears. Parenthetical values represent interquartile (Q1-Q3) mean ranges.

The percentage of patients with good or excellent results based on ASES scoring was similar for groups 1 and 2 (88% vs 84%). An additional 2 patients (8%) had fair results in both groups. One patient (4%) in group 1 and 2 patients (8%) in group 2 had poor results.

Statistical Analysis

There were no statistically significant differences in the preoperative and postoperative ASES scores between groups 1 and 2 (Table 3). The change or increase in ASES scores from preoperative to postoperative was statistically significant for both groups with the magnitude of improvement nearly identical. Comparison of postoperative ASES scores for arm dominance, mechanism of injury, presence or absence of osteoarthritis, and partial-thickness rotator cuff tears is summarized in Table 4. A traumatic mechanism of injury ($P = .0346$) and the presence of osteoarthritis ($P = .0401$) were associated with significantly lower postoperative ASES scores.

With regard to range of motion, there was a statistically significant decrease between preoperative and postoperative measurements for internal rotation in group 1 and forward elevation in group 2. All other range of motion measurements revealed no differences (Table 5).

TABLE 5
Comparison of Mean Change in Range of Motion for Both Groups From Preoperative to Postoperative[a]

	Group 1: <40 Years		Group 2: ≥40 Years	
	Change	P	Change	P
FE	–1.60	.2	–8.04	.0003
ER	–5.00	.1555	0.52	.8736
IR	–5.52	.0321	–2.00	.722

[a]Range of motion data are expressed in degrees. ER, external rotation at 90° abduction; FE, forward elevation; IR, internal rotation at 90° abduction.

TABLE 6
Comparison of Osteoarthritis and Ability to Return to Prior Level of Activity[a]

	Osteoarthritis, %	
Able to Return to Prior Level of Activity	No	Yes
No	14.6	71.4
Yes	85.4	28.6

[a]$P = .0044$.

The ability to return to prior level of activity was similar for groups 1 and 2: 80% versus 74% ($P = .122$). Five (20%) patients in group 1 and 6 (24%) patients in group 2 were unable to return to prior level of activity. If comparing only recreational athletes (nonprofessional) without arthritis, the return to prior level increases (group 1, 89%; group II, 94%). Excluding the patients who were unable to return to sport at final follow-up, the mean time to full return to activity or sport was 8.45 months for group 1 and 11.0 months for group 2, which approached statistical significance ($P = .0962$). Matching recreational athletes without arthritis, this difference was significant (group 1, 5.3 months; group 2, 11.1 months; $P = .0335$). Finally, patients with osteoarthritis were significantly less likely to return to activity than were those without the condition ($P = .0044$) (Table 6).

DISCUSSION

To our knowledge, this is the first study that evaluates age as it relates to functional outcome for isolated SLAP repairs. Kim et al,[8] in describing the clinical features associated with different SLAP tear variants, observed the high association of glenohumeral osteoarthritis and rotator cuff lesions in patients older than 40 years who were diagnosed with type II SLAP tears. This differed from the type II SLAP lesion in the younger population, in which instability was a more common finding. Considering these findings, it is reasonable, therefore, to be concerned about loss of motion as well as pain resolution in the older population after SLAP repairs.

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Furthermore, we have anecdotally observed that older patients with isolated type II SLAP tears more often relay a traumatic injury precipitating the onset of their pain. Snyder et al,[13] in evaluating SLAP tears in 27 patients with a mean age approaching 40 years, reported the most common mechanism of injury as a fall on an outstretched arm or compressive mechanism. Younger patients typically develop these lesions atraumatically, as a consequence of repetitive activity. Burkhart and Morgan[3] proposed a peel-back mechanism that produces biceps anchor instability, described mainly in the younger, overhead athlete. Therefore, potential differences in the mechanism of injury for older and younger age groups may also affect outcome after SLAP repairs.

We included only isolated type II SLAP repairs in our study to remove any confounding variables that could arise as a result of including patients with impingement symptoms or concomitant procedures. Chart review revealed a predominance of unstable superior labral findings on preoperative physical examination (active compression test, anterior apprehension sign) with impingement signs absent or equivocal in the great majority of patients. We evaluated the outcome with ASES scores and range of motion. Furthermore, the decision for operative intervention of isolated SLAP tears, especially in older patients, should be greatly influenced by the patient's activity level, in addition to the degree of pain. Nearly all patients in this study participated in athletic activity at some level, and we were, therefore, able to use this as an outcome measure by evaluating ability to return to prior level of activity or sport and the time to full return. Overall, we hypothesized that the outcome of isolated type II SLAP repairs depends on age and may reveal worse outcomes for the older age group with regard to stiffness and resolution of symptoms.

Our results demonstrated no difference in ASES scores and proportion of patients with good or excellent results between age groups. The improvement in scores from preoperative to postoperative was nearly identical for both groups. Because 50% of the ASES scoring is composed of pain assessment, we can conclude that the procedure provided significant pain relief.

Regarding mechanism of injury, we found that a traumatic mechanism was associated with significantly lower ASES scores (P = .0346). Despite this mechanism occurring twice as often in the older group (48% vs 24%), comparison of final outcome scores between older and younger patients with a traumatic mechanism of injury did not demonstrate a significant difference (group 1, 88; group 2, 83; P = .0812).

There were modest but statistically significant losses of range of motion for both age groups. Patients younger than 40 years lacked a mean 5.5° internal rotation, whereas those 40 years and older lacked 8° of forward elevation compared with preoperative values. There were no significant losses of external rotation for either age group. These findings, although difficult to interpret, did not affect outcome as measured by ASES score or ability to return to activity.

The ability to return to preinjury level of activity/sport after SLAP repairs was not influenced by age. However, of the 6 patients in the older group who were unable to return to the same level of sport, 5 had evidence of osteoarthritis at the time of arthroscopy. Therefore, patients with osteoarthritis had a significantly lower return to prior level of activity (P = .0044) and lower ASES scores (P = .0401) than did those without arthritic changes.

A preoperative diagnosis of glenohumeral osteoarthritis, particularly in the early stages, is not always evident on radiological studies and can complicate the treatment management. The degree to which arthritic changes contribute to clinical symptoms, particularly in the presence of unstable labral lesions, can be difficult to ascertain, despite preoperative history, physical examination, and sophisticated imaging. We counsel all patients, particularly those in the older age group, who are indicated for isolated labral repairs that the presence of arthritic changes may lead to a delay in return to activity and less predictable results.

For the younger age group, 4 of the 5 patients who were unable to return to sport were professional athletes. In a recent study pending publication performed at our institution, the ability to return to prior level of competition for professional athletes after SLAP repairs is lower than what is expected for the general population. If patients with osteoarthritis and professional athletes are excluded from the data, the return to sport increases for both groups (group 1, 89%; group 2, 94%).

There was a prolonged time to full return to sport for the older age group, averaging nearly 3 months longer than that of their younger cohort, which approached statistical significance (P = .0962). Removing professional athletes and patients with osteoarthritis from this calculation, and therefore matching recreational athletes without osteoarthritis in each age group, the disparity is statistically significant and increases to 6 months (P = .0013). This difference likely reflects the rehabilitation and prolonged recovery time experienced by older patients after surgery.

There are significant limitations to this study. First, the study is a retrospective review and therefore harbors the inherent errors of retrospective data collection. Second, we were unable to contact and evaluate all patients who underwent surgical treatment in the reviewed time period, exposing the study to potential nonresponse bias. Third, although the study was performed at a single institution by sports medicine fellowship–trained surgeons, it represents the experience of 3 surgeons rather than a single surgeon's experience.

In conclusion, good or excellent results, as measured by ASES scores, and high return to prior level of activity can be expected for the majority of properly indicated patients who undergo isolated type II SLAP repairs, regardless of age. Subtle deficits in range of motion were experienced by patients in both age groups, but this did not affect their final outcomes. The presence of osteoarthritis, however, was associated with lower ASES scores and the inability to return to prior level of activity. Finally, the time to return to activity was prolonged for the older group.

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