No Advantages in Repairing a Type II Superior Labrum Anterior and Posterior (SLAP) Lesion When Associated With Rotator Cuff Repair in Patients Over Age 50: A Randomized Controlled Trial

Francesco Franceschi, Umile Giuseppe Longo, Laura Ruzzini, Giacomo Rizzello, Nicola Maffulli and Vincenzo Denaro

Am. J. Sports Med. 2008; 36; 247 originally published online Oct 16, 2007;
DOI: 10.1177/0363546507308194

No Advantages in Repairing a Type II Superior Labrum Anterior and Posterior (SLAP) Lesion When Associated With Rotator Cuff Repair in Patients Over Age 50

A Randomized Controlled Trial

Francesco Franceschi,* MD, Umile Giuseppe Longo,* MD, Laura Ruzzini,* MD, Giacomo Rizzello,* MD, Nicola Maffulli,†‡ MD, PhD, FRCS (Orth), and Vincenzo Denaro,* MD
*From the *Department of Orthopaedic and Trauma Surgery, Campus Biomedico University, Rome, Italy, and the ‡Department of Trauma and Orthopaedic Surgery, University Hospital of North Staffordshire, Keele University School of Medicine, Stoke on Trent, United Kingdom*

Background: Arthroscopic management has been recommended for some superior labrum anterior and posterior (SLAP) lesions, but no studies have focused on patients over 50 years of age with rotator cuff tear and a type II SLAP lesion.

Hypothesis: In patients over 50 years of age with an arthroscopically confirmed lesion of the rotator cuff and a type II SLAP lesion, there is no difference between (1) repair of both lesions and (2) repair of the rotator cuff tear without repair of the SLAP II lesion but with a tenotomy of the long head of the biceps.

Study Design: Randomized controlled clinical trial; Level of evidence, 1.

Methods: We recruited 63 patients. In 31 patients, we repaired the rotator cuff and the type II SLAP lesion (group 1). In the other 32 patients, we repaired the rotator cuff and tenotomized the long head of the biceps (group 2). Seven patients (2 in group 1 and 5 in group 2) were lost to final follow-up.

Results: At a minimum 2.9 years' follow-up, statistically significant differences were seen with respect to the University of California, Los Angeles (UCLA) score and range of motion values. In group 1 (SLAP repair and rotator cuff repair), the UCLA showed a statistically significant improvement from a preoperative average rating of 10.4 (range, 6-14) to an average of 27.9 (range, 24-35) postoperatively ($P < .001$). In group 2 (biceps tenotomy and rotator cuff repair), the UCLA showed a statistically significant improvement from a preoperative average rating of 10.1 (range, 5-14) to an average of 32.1 (range, 30-35) postoperatively ($P < .001$) There was a statistically significant difference in total postoperative UCLA scores and range of motion when comparing the 2 groups postoperatively ($P < .05$).

Conclusions: There are no advantages in repairing a type II SLAP lesion when associated with a rotator cuff tear in patients over 50 years of age. The association of rotator cuff repair and biceps tenotomy provides better clinical outcome compared with repair of the type II SLAP lesion and the rotator cuff.

Keywords: rotator cuff; tenotomy; biceps tendon; shoulder; arthroscopy; SLAP lesion

Several surgical techniques to repair superior labrum anterior and posterior (SLAP) lesions have been developed.[16-18,20-22] Arthroscopic management has been recommended for some SLAP lesions. Although good results have been reported with debridement alone for type I and type III lesions, surgical repair is preferred for type II lesions when the biceps anchor is unstable.[20]

Moreover, the findings associated with type II lesions differ according to the patient's age: type II lesions in patients 40 years of age or younger are commonly associated only with a Bankart lesion, whereas those in patients older than age 40 are associated with a supraspinatus tear and osteoarthritis of the humeral head.[16] Furthermore, type II lesions in patients under 40 years of age are also

†Address correspondence to Nicola Maffulli, Thornburrow Drive, Hartshill, Stoke on Trent, United Kingdom ST4 7QB (e-mail: osa14@keele.ac.uk).

No potential conflict of interest declared.

The American Journal of Sports Medicine, Vol. 36, No. 2
DOI: 10.1177/0363546507308194

associated with partial-thickness rotator cuff tears and, in throwing athletes, with internal rotation deficits.[16]

Several studies have shown the efficacy of arthroscopic repair for type II SLAP lesions without other associated lesions, but the only data reported on the association of arthroscopic repair of type II SLAP lesions and rotator cuff tears involve young and active patients.[18,20,21] To our knowledge, no studies have focused on patients over 50 years of age.

We evaluated the results of a randomized controlled trial of arthroscopic repair in patients over age 50 with rotator cuff tears and a type II SLAP lesion in whom the repair was effected repairing the 2 lesions, or repairing the rotator cuff tears and performing a tenotomy of the long head of the biceps.

We wished to test the null hypothesis that in patients over age 50 with an arthroscopically confirmed lesion of the rotator cuff and a type II SLAP lesion, there is no difference between (1) repair of both lesions and (2) repair of the rotator cuff tear without repair of the SLAP II lesion but performing a tenotomy of the long head of the biceps.

MATERIALS AND METHODS

Our institutional ethics review board approved the study, and all patients gave written informed consent to participate in this clinical trial.

Eligibility Criteria

Patients were included in the study if they had a rotator cuff tear diagnosed on clinical grounds, were older than 50 years, had no episodes of shoulder instability, no radiographic signs of fracture of the glenoid or the greater or lesser tuberosity, MRI evidence of cuff tear and type II SLAP lesion, duration of symptoms of at least 3 months, inadequate response to nonoperative management (including nonsteroidal anti-inflammatory drugs, physiotherapy, rest, and 1 local corticosteroid injection), a rotator cuff tear, and a type II SLAP lesion found at the time of surgery.

Patients were excluded from the study if they had inflammatory joint disease, prior surgery on the affected shoulder, an arthroscopic diagnosis of subscapularis tendon tear, or inability to complete questionnaires because of language problems or cognitive disorder. Patients younger than 50 years of age were also excluded from the study.

Recruitment and Randomization

Patients were tertiary referrals to our center because of symptoms of rotator cuff tears. Eligible patients were enrolled by the examining orthopaedic surgeon. Each patient was given full oral and written information about the trial, and written informed consent was obtained by the operating surgeon.

Recruitment started in January 1999 and was completed in December 2003. Of 431 patients screened for eligibility, 63 patients were eligible and were randomized: 31 patients to repair of the rotator cuff and repair of the type II SLAP lesion (group 1) and 32 patients to repair of the rotator cuff tear and tenotomy of the long head of the biceps (group 2).

All patients received the allocated treatment. Of 63 patients randomized to 1 of the 2 treatments, 5.2-year results were available for 56. Seven patients (2 in group 1 and 5 in group 2) did not return at the final follow-up (Figure 1).

Evaluation

We performed preoperative evaluations the day before surgery, and report the results of postoperative evaluation at a final follow-up at an average of 5.2 years (range, 2.9-7.8 years) from the operation. Each patient was evaluated for arm dominance, trauma history, duration and type of preoperative symptoms, type of lesion, preoperative and postoperative range of motion (ROM), and preoperative and postoperative modified shoulder score (University of California, Los Angeles [UCLA]).

Imaging

All patients received a standard preoperative assessment using standard radiographs (anteroposterior projections; neutral, external, and internal rotation; a lateral view of the scapula; and an axillary view) and MRI scans. Oblique coronal, oblique sagittal, and axial T2-weighted spin-echo MRI scans (repetition time, 3200 ms; echo time, 85 ms) were obtained in all patients.

Functional Assessment

A modified UCLA[7] shoulder rating scale was used to evaluate preoperative and postoperative shoulder pain (10 points), function (10 points), active forward flexion (5 points), strength (5 points), and patient satisfaction (5 points). The maximum score obtainable is 35, and the results were classified as excellent (34-35 points), good (28-33), fair (21-27), or poor (0-20).

Range of Motion

A standard universal goniometer was used for measurement with scales marked in 1-degree increments. Patients were positioned supine on an examining couch with the shoulder at 90° of abduction in the scapular plane (approximately 15° anterior to the coronal plane). Measurement of supine forward elevation (sagittal plane) and internal and external rotation (90° of abduction) were obtained using standard measurement guidelines.[2] Care was taken to fix the scapula with 1 hand while the examiner's other hand rotated the shoulder into position. One examiner (L.R.) held the shoulder position, while a second examiner (U.G.L.) obtained the measurement after a firm end point was established. The forearm was held in neutral rotation during rotational measurement. Three measurements were taken for each shoulder, and the mathematical average was used for statistical purposes.

Randomization Procedure

After a diagnostic arthroscopy assessing the status of the shoulder joint, we ascertained the presence and the size of the rotator cuff tear and the type II SLAP lesion. If this

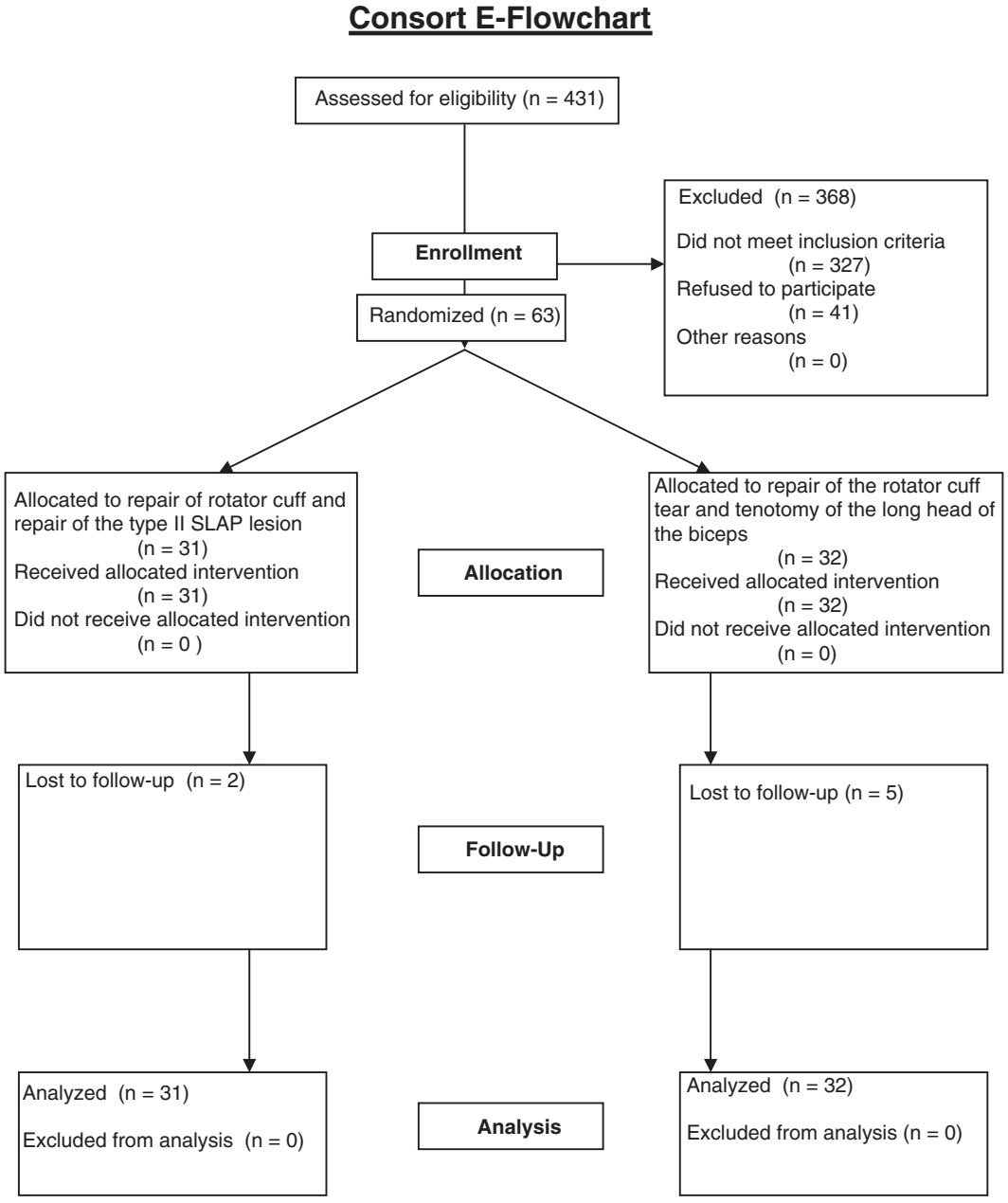

Figure 1. CONSORT statement detailing the flow of patients in the study.

was the case, at that stage patients were randomized into 1 of 2 groups, to receive either rotator cuff repair and SLAP repair (group 1) or rotator cuff repair and tenotomy of the long head of the biceps tendon (group 2).

We used a random-numbers table to allocate subjects. Starting with an arbitrary point in the table, we selected 63 sequential random numbers. The first 31 numbers were assigned to group 1, and the next 32 were assigned to group 2. These assignments were then arranged in an ascending order. This procedure produced a random sequence of consecutive treatment allocations. Sealed, opaque numbered envelopes containing the treatment assignments were prepared, with care being taken to make sure that the order of the envelopes exactly matched the allocation schedule.

All surgical interventions were performed by the same surgeon (F.F.). After diagnostic arthroscopy, the extent of the tear was assessed, the tendon margins were debrided, and a bone bed was prepared using a power shaver so as not to decorticate the bone. The rotator cuff tears were classified according to their size, shape, and location. At that time, the envelope was opened, and the patient allocated to either group 1 or group 2.

In group 1 (rotator cuff repair and type II SLAP lesion repair), there were 18 men and 13 women (mean age, 61.8 years; range, 51-79). The dominant arm was affected in 25 patients. The rotator cuff tears were classified as small (<1 cm) in 11 patients, medium (1-3 cm) in 8 patients, and large (3-5 cm) in 12 patients. There were 18 crescentic lesions, 10 L-shaped lesions, and 3 U-shaped lesions. The

tear involved the supraspinatus tendon in 19 patients, and the supraspinatus and infraspinatus tendons in 12 patients.

The SLAP lesions were classified as type IIA in 12 patients, type IIB in 7 patients, and type IIC in 12 patients.[17] An acromioplasty was performed in 7 patients.

In group 2 (rotator cuff tear repair and tenotomy of the long head of the biceps), there were 15 men and 17 women (mean age, 64.7 years; range, 53-81). The dominant arm was affected in 23 patients. The rotator cuff tears were classified as small (<1 cm) in 8 patients, medium (1-3 cm) in 15 patients, and large (3-5 cm) in 9 patients. There were 13 crescentic lesions, 8 L-shaped lesions, and 11 U-shaped lesions. The tear involved the supraspinatus tendon in 18 patients and the supraspinatus and infraspinatus tendons in 14 patients.

The SLAP lesions were classified as type IIA in 10 patients, type IIB in 9 patients, and type IIC in 13 patients. An acromioplasty was performed in 9 patients.

The number of suture anchors used to repair the rotator cuff tear varied with the size of the tear and the type of repair techniques. We used an average of 2.1 (range, 1-4) anchors in group 1, and 2.3 anchors (range, 1-4) in group 2.

The number of suture anchors used to repair the type II SLAP lesions in group 1 varied with the size of the lesion. We used 1 anchor in 9 patients and 2 anchors in 22 patients.

Arthroscopic Technique

Patients underwent brachial plexus block (associated, in 7 patients, with general anesthesia), and were placed in a lateral decubitus position. The arm was suspended at approximately 45° of abduction and 20° of forward flexion. Distraction of the shoulder joint was accomplished with 4.5 to 6.5 kg of traction. A diagnostic arthroscopy was then performed to evaluate the extent of the rotator cuff tear, any lesions of the biceps tendon, and other associated lesions. To control bleeding, we used radiofrequency, adrenalin admixture to the irrigation fluid, and asked the anesthesiologist to lower the systolic blood pressure to 90 mm Hg if possible. An arthroscopic pump maintained fluid pressure at 40 mm Hg, increasing it temporarily on demand.

In group 1, the SLAP repair was performed using suture anchors (Biofastak, Arthrex, Naples, Fla). Anterior lesions were repaired by placing the anchor from a standard anterosuperior approach. For labral repair in the posterosuperior quadrant of the glenoid, we used a posterosuperior lateral acromial portal (Port of Wilmington) for suture anchor placement. Suture anchors were placed at the articular margin and angled 45° medial to ensure bony purchase. In group 2 (tenotomy and rotator cuff repair), biceps tenotomy was performed by a simple resection as close as possible to the biceps stump at the superior labrum.[14]

A subacromial decompression was performed in presence of a type III acromion.

The lateral portal was used to mobilize the rotator cuff back to its bony insertion. Using a bur through the lateral portal, the footprint of the greater tuberosity was abraded.

The rotator cuff repair was performed placing one row of suture anchors double loaded with No. 2 fiberwire (Biocorkscrew, Arthrex) just in the lateral aspect of the footprint. The number of suture anchors varied with the size of the tear and the type of repair techniques.

Postoperative Management

Postoperative management was the same for both groups. The arm was supported using a sling with an abduction pillow for 6 weeks. Active elbow flexion and extension were allowed, but terminal extension was restricted. Passive external rotation was started from the first day after surgery, and maintained within a comfortable range. Overhead stretching was restricted until 6 weeks postoperatively to avoid damaging the repair. At 6 weeks, the sling was removed, and overhead stretching with a rope and pulley were started. Isoinertial strengthening and rehabilitation of the rotator cuff, deltoid, and scapular stabilizers were initiated at 10 or 12 weeks after the operation. Rehabilitation was continued for 6 months. Heavy manual work and overhead activities were allowed after a good restoration of shoulder strength, which occurred 6 to 10 months after surgery.

Statistics

Statistical analyses were blinded and performed according to the "intention-to-treat" principle. Descriptive statistics were calculated. The results of surgery in the 2 groups were compared using the Wilcoxon signed rank test. Significance was set at $P < .05$. We used a nonparametric test because the patients did not follow a normal (Gaussian) distribution.

RESULTS

No patient experienced infection or neurologic or vascular complications.

The mean operative time was 90 ± 22.5 minutes (range, 75-110) for group 1 (SLAP repair and rotator cuff repair), and 60 ± 16.4 minutes (range, 47-85) for group 2 (biceps tenotomy and rotator cuff repair).

Group 1 SLAP Repair and Rotator Cuff Repair

The UCLA rating system showed a statistically significant improvement from a preoperative average rating of 10.4 (range, 6-14) to an average of 27.9 (range, 24-35) postoperatively ($P < .001$). When considering the various components of the modified UCLA score, the mean pain score improved from 3.5 (range, 1-4) to 9.0 (range 6-10) ($P < 0.001$). The mean function score increased from 2.4 (range 1-4) to 7.3 (range, 4-8) ($P < .001$). The mean satisfaction score improved from 0 to 3.4 points (range, 2-4). The active forward flexion improved from 2.1 (range 0-3) to 3.8 (range 2-4) ($P < .001$) (Table 1). The strength score improved from 2.4 (range, 0-3) to 4.4 (range, 3-5) ($P < .001$). Forward flexion averaged 107° (range, 30°-140°) preoperatively and 139° (range, 120°-170°) at final follow-up ($P < .001$) (Table 2). The average external rotation improved from 81.7° (range, 65°-95°) preoperatively to 121.4° (range, 90°-140°) at final follow-up ($P < .001$). Internal rotation increased from a mean of 26.0° (range, 20°-33°) preoperatively to a mean of 34.3° (range, 26°-40°) at final follow-up ($P < .001$).

TABLE 1
UCLA Scores[a]

	Group 1 (SLAP Repair and Rotator Cuff Repair)		Group 2 (Biceps Tenotomy and Rotator Cuff Repair)	
	Preoperative	Postoperative	Preoperative	Postoperative
Total UCLA	10.4 (6-14)	27.9 (24-35)	10.1 (5-14)	32.1 (30-35)
Pain	3.5 (1-4)	9.0 (6-10)	2.8 (1-4)	9.3 (6-10)
Function	2.4 (1-4)	7.3 (4-8)	2.6 (1-4)	9.2 (7-10)
Forward flexion (active)	2.1 (0-3)	3.8 (2-4)	2.4 (0-3)	4.8 (3-5)
Strength	2.4 (0-3)	4.4 (3-5)	2.3 (0-3)	4.2 (3-5)
Satisfaction	0	3.4 (2-4)	0	4.6 (2-4)

[a]UCLA, University of California, Los Angeles; SLAP, superior labrum anterior and posterior (lesion). Values are mean (range).

TABLE 2
Range of Motion[a]

	Group 1 (SLAP Repair and Rotator Cuff Repair)		Group 2 (Biceps Tenotomy and Rotator Cuff Repair)	
	Preoperative	Postoperative	Preoperative	Postoperative
Forward flexion	107° (30°-140°)	139° (120°-170°)	99° (30°-140°)	166° (140°-170°)
External rotation	81.7° (65°-95°)	121.4° (90°-140°)	76.6° (60°-90°)	134.3° (90°-140°)
Internal rotation	26.0° (20°-33°)	34.3° (26°-40°)	29.1° (21°-35°)	40.0° (30°-45°)

[a]SLAP, superior labrum anterior and posterior (lesion). Values are mean (range).

Eight patients were involved in sports, and 3 of them returned to their preinjury levels of sports. At follow-up, no patients presented a "Popeye" sign at rest or during elbow flexion.

Group 2 Biceps Tenotomy and Rotator Cuff Repair

The UCLA rating system showed a statistically significant improvement from a preoperative average rating of 10.1 (range, 5-14) to an average of 32.1 (range, 30-35) postoperatively ($P < .001$). When considering the various components of the modified UCLA score, the mean pain score improved from 2.8 (range, 1-4) to 9.3 (range, 6-10) ($P < .001$). The mean function score increased from 2.6 (range, 1-4) to 9.2 (range, 7-10) ($P < .001$). The active forward flexion improved from 2.4 (range, 0-3) to 4.8 (range, 3-5) ($P < .001$). The strength score improved from 2.3 (range, 0-3) to 4.2 (range, 3-5) ($P < .001$). The mean satisfaction score improved from 0 to 4.6 (range 2-4) points (Table 1).

Forward flexion averaged 99° (range, 30°-140°) preoperatively and 166° (range, 140°-170°) at final follow-up ($P < .001$) (Table 2). The average external rotation improved from a mean value of 76.6° (range, 60°-90°) preoperatively to 134.3° (range, 90°-140°) postoperatively ($P < .001$). Internal rotation increased from a mean of 29.1° (range, 21°-35°) preoperatively to a mean of 40.0° (range, 30°-45°) at final follow-up ($P < .001$).

Six patients were involved in sports, and all of them returned to their preinjury levels of sports.

Eleven men and 8 women had a Popeye sign at rest, during elbow flexion, or during both, without statistically significant differences between the genders ($P > .05$). None were bothered by it.

Patients of group 2 showed statistically significantly better results in function, active forward flexion, and satisfaction ($P < .05$). They also showed statistically significantly better results in total postoperative UCLA scores and ROM in each of the ranges reported ($P < .05$).

We analyzed our data comparing the outcome of each type of SLAP II lesion (IIA, IIB, and IIC). We did not find any association between type of SLAP lesion and clinical results.

DISCUSSION

To our knowledge, this is the first randomized controlled trial to report the outcome of arthroscopic repair of type II SLAP lesion associated with rotator cuff tear in patients over 50 years of age. We compared the clinical outcome of patients over age 50 affected with rotator cuff tears and type II SLAP lesion in whom both the defects were repaired, or the rotator cuff tear was repaired and the long head of the biceps tendon was tenotomized. In our hands, the association of rotator cuff repair and biceps tenotomy provides better clinical outcome compared with repair of type II SLAP lesion and of the rotator cuff.

Major strengths of the present study are that a single fully trained surgeon performed all the operations using a well-established technique, and the follow-up evaluations were performed by independent assessors. Our follow-up of 5.2 years is long enough to consider that, by then, the

results of surgery had stabilized, and recovery effected. Long-term evaluation is necessary, particularly as these injuries often occur in patients who are at risk for the development of postoperative stiffness.

We acknowledge that we did not consider a third group in which neither SLAP repair nor biceps tenotomy was performed, but the present evidence suggests that the optimal management of a type II SLAP lesion is to repair.[1,17,18,20,21] When we prospected the option of this third group, our Research Ethics Committee stated that they would not have allowed a "nonrepair" option.

Another limitation of the study is that we did not quantify fatigability of the upper arm after either procedure in any way. Should we plan another study of this kind, we would try and include such outcome measure in our evaluation protocol.

We acknowledge that we did not perform a formal power analysis; we planned the choice of the number of patients to enroll in the study according to what we knew our unit could deliver within the time we chose to allocate to the study, and based on our concomitant studies.[8,10] However, despite this partial weakness of the present investigation, our selection and recruitment process, our assessment criteria, and our follow-up were extremely rigorous, and performed in strict scientific fashion. Also, with the numbers of patients enrolled, the results of our study are univocal.

It is difficult to compare the findings of the present study with those of previous reports, as we know of no other studies to report the clinical outcome of surgical treatment of rotator cuff tears associated with type II SLAP lesions in patients over 50 years of age. Although arthroscopic repair is well established for the management of type II SLAP lesions, and various techniques of repair have been described,[4,5,22] no studies focused on the association of SLAP lesions with rotator cuff tears in patients over age 50.

Voos et al[23] retrospectively evaluated the clinical outcomes of a series of 30 patients (average age, 47.8 years) with combined rotator cuff and labral (Bankart or SLAP) lesions managed arthroscopically. They concluded that in patients with rotator cuff and labral lesions, arthroscopic management of both lesions yields good clinical outcomes, restoration of motion, and a high degree of patient satisfaction.

Rhee et al[21] reported on 44 unstable SLAP lesions in 41 patients (mean age at the time of surgery, 24 years) who did not have other pathologic shoulder findings. They showed that arthroscopic management of unstable isolated SLAP lesions resulted in good or excellent UCLA scores in 86% of the patients.

O'Brien et al[18] evaluated the outcome of 31 patients at a mean of 3.7 years with type II SLAP lesions treated with a Suretac device (Acufex Microsurgical, Mansfield, Mass). The average age of the patients was 39 years. Of 31 patients, 22 (71%) rated their overall satisfaction as good or excellent, but patients with concomitant rotator cuff tears were excluded from the study.

Kim et al[16] noted that type II lesions in older patients have clinical features similar to those of type I lesions, whereas type II lesions in younger patients have clinical features that are closer to those of type III and IV lesions. Also, the findings associated with type II lesions differ according to the patient's age: type II lesions in patients 40 years of age or younger were associated only with a Bankart lesion, whereas those in patients older than 40 were associated with a supraspinatus tear and osteoarthritis of the humeral head.

Morgan et al[17] studied 102 patients with an average age of 33 years with a type II SLAP lesion; rotator cuff tears were present in 31% of patients. They pointed out that in patients in whom a complete rotator cuff tear is associated with a type II SLAP lesion, both should be repaired to remove the SLAP lesion that likely caused the cuff tear in the first place.

Paxinos et al[20] reported on 24 patients with a mean age of 36 years identified at arthroscopy to have a superior labral tear and had the superior labrum repaired with a biodegradable device. Four of them had associated rotator cuff tears (2 partial-thickness tears and 2 full-thickness tears) repaired via an open deltoid-splitting approach at the time of surgery. Arthroscopically delivered biodegradable tacks effectively managed superior labral tears and, on average, resulted in a near-complete improvement of pain and recovery of function by 3 months.

The mean age of our patients was 63 years. Although tenotomy is not the ideal intervention for patients of all ages with various shoulder abnormalities, it appears to be an acceptable surgical intervention for a specifically selected cohort of individuals.[14]

Kempf et al[15] reported on 210 patients with arthroscopically managed rotator cuff tears of whom 18% had a tenotomy of the tendon of the long head of the biceps. When compared with the nontenotomized group, the tenotomized group had statistically significant improvements in the level of physical activity, active mobility, and pain variables.

Labral debridement was one of the initial treatments for arthroscopically confirmed superior labral lesions. The short-term results were promising, but with longer follow-up, the results were disappointing. For example, Altchek et al[1] concluded that labral debridement was effective for short-term symptomatic relief, but was not as effective at 24 months. They hypothesized that the long-term problem was probably a result of occult instability remaining in the shoulder.

The disadvantages of biceps tenotomy may be distal migration of the long head of the biceps tendon with cosmetic deformity (Popeye sign) and significantly impaired shoulder strength. However, it is a quick procedure that does not require fixation.[8-10,14]

Walch et al[24] reported that many of their patients had little to no cosmetic deformity in the anterior arm in a series of patients with rotator cuff tears in which the long head of the biceps tendon was released. Osbahr et al[19] reported on the cosmetic appearance of tenotomy versus tenodesis. The results revealed that there was no significant difference in the patients' self-rated levels of anterior shoulder pain, cosmetic deformity, and muscle spasm between the 2 groups.

The prevalence of associated pathologic findings, and clinical features of the different types of SLAP lesion, can vary with the patient population studied. Isolated SLAP lesions with no associated pathologic findings are uncommon.[16] Consequently, when a SLAP lesion coexists with other clinical syndromes or anatomic lesions, it is difficult

to know whether the success or failure of a given management regimen is due to the management of the SLAP lesion or to the management of the other pathologic entities.[3,6,11-13]

Based on our study results, we now routinely perform a biceps tenotomy in patients over age 50 with a type II SLAP tear undergoing rotator cuff repair, but other randomized controlled trials are necessary to answer whether simply to leave the SLAP lesion alone, but repair the rotator cuff tear, is sufficient to determine an acceptable postoperative outcome.

Our study demonstrated many of the difficulties involved in understanding the causes and treatment of SLAP lesions, and cannot answer the question of whether type II SLAP lesions are a cause or result of rotator cuff tear.

In conclusion, in our hands there are no advantages in repairing a type II SLAP lesion when associated with a rotator cuff tear in patients over 50 years of age. The association of rotator cuff repair and biceps tenotomy provides better clinical outcome compared with repair of the type II SLAP lesion and of the rotator cuff. Rotator cuff repair alone is sufficient to determine a good postoperative outcome, allowing to avoid postoperative stiffness of the shoulder. Additional biomechanical and clinical investigations are needed to understand the pathophysiology and treatment of these lesions.

REFERENCES

1. Altchek DW, Warren RF, Wickiewicz TL, Ortiz G. Arthroscopic labral debridement: a three-year follow-up study. *Am J Sports Med.* 1992; 20:702-706.
2. American Academy of Orthopaedic Surgeons. *Joint Motion: Method of Measuring and Recording*. Chicago: American Academy of Orthopaedic Surgeons; 1965.
3. Baysal D, Balyk R, Otto D, Luciak-Corea C, Beaupre L. Functional outcome and health-related quality of life after surgical repair of full-thickness rotator cuff tear using a mini-open technique. *Am J Sports Med.* 2005;33:1346-1355.
4. Burkhart SS, Morgan C. SLAP lesions in the overhead athlete. *Orthop Clin North Am.* 2001;32:431-441.
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;14:637-640.
6. Cofield RH, Parvizi J, Hoffmeyer PJ, Lanzer WL, Ilstrup DM, Rowland CM. Surgical repair of chronic rotator cuff tears: a prospective long-term study. *J Bone Joint Surg Am.* 2001;83:71-77.
7. Ellman H, Hanker G, Bayer M. Repair of the rotator cuff: end-result study of factors influencing reconstruction. *J Bone Joint Surg Am.* 1986;68:1136-1144.
8. Franceschi F, Longo UG, Ruzzini L, Papalia R, Rizzello G, Denaro V. To detach the long head of the biceps tendon after tenodesis or not: outcome analysis at the 4-year follow-up of two different techniques. *Int Orthop.* 2007;31:537-545.
9. Franceschi F, Longo UG, Ruzzini L, Rizzello G, Denaro V. Arthroscopic management of calcific tendinitis of the subscapularis tendon. *Knee Surg Sports Traumatol Arthrosc.* 2007 May 12; [Epub ahead of print].
10. Franceschi F, Ruzzini L, Longo UG, et al. Equivalent clinical results of arthroscopic single-row and double-row suture anchor repair for rotator cuff tears: a randomized controlled trial. *Am J Sports Med.* 2007;35:1254-1260.
11. Gartsman GM. Arthroscopic rotator cuff repair. *Clin Orthop Relat Res.* 2001;390:95-106.
12. Gartsman GM, Khan M, Hammerman SM. Arthroscopic repair of full-thickness tears of the rotator cuff. *J Bone Joint Surg Am.* 1998;80:832-840.
13. Jost B, Pfirrmann CW, Gerber C. Clinical outcome after structural failure of rotator cuff repairs. *J Bone Joint Surg Am.* 2000;82:304-314.
14. Kelly AM, Drakos MC, Fealy S, Taylor SA, O'Brien SJ. Arthroscopic release of the long head of the biceps tendon: functional outcome and clinical results. *Am J Sports Med.* 2005;33:208-213.
15. Kempf JF, Gleyze P, Bonnomet F, et al. A multicenter study of 210 rotator cuff tears treated by arthroscopic acromioplasty. *Arthroscopy.* 1999;15:56-66.
16. 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: superior labrum anterior posterior. *J Bone Joint Surg Am.* 2003;85:66-71.
17. Morgan CD, Burkhart SS, Palmeri M, Gillespie M. Type II SLAP lesions: three subtypes and their relationships to superior instability and rotator cuff tears. *Arthroscopy.* 1998;14:553-565.
18. O'Brien SJ, Allen AA, Coleman SH, Drakos MC. The trans-rotator cuff approach to SLAP lesions: technical aspects for repair and a clinical follow-up of 31 patients at a minimum of 2 years. *Arthroscopy.* 2002;18:372-377.
19. Osbahr DC, Diamond AB, Speer KP. The cosmetic appearance of the biceps muscle after long-head tenotomy versus tenodesis. *Arthroscopy.* 2002;18:483-487.
20. Paxinos A, Walton J, Rutten S, Muller M, Murrell GA. Arthroscopic stabilization of superior labral (SLAP) tears with biodegradable tack: outcomes to 2 years. *Arthroscopy.* 2006;22:627-634.
21. Rhee YG, Lee DH, Lim CT. Unstable isolated SLAP lesion: clinical presentation and outcome of arthroscopic fixation. *Arthroscopy.* 2005;21:1099.
22. Snyder SJ, Banas MP, Karzel RP. An analysis of 140 injuries to the superior glenoid labrum. *J Shoulder Elbow Surg.* 1995;4:243-248.
23. Voos JE, Pearle AD, Mattern CJ, Cordasco FA, Allen AA, Warren RF. Outcomes of combined arthroscopic rotator cuff and labral repair. *Am J Sports Med.* 2007;35:1174-1179.
24. Walch G, Boileau P, Noel E, Liotard JP, Dejour H. Surgical treatment of painful shoulders caused by lesions of the rotator cuff and biceps, treatment as a function of lesions: reflections on the Neer's concept [in French]. *Rev Rhum Mal Osteoartic.* 1991;58:247-257.