The Results of Arthroscopic Subscapularis Tendon Repairs

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Purpose: The purpose of this study was to evaluate patients after an arthroscopic subscapularis tendon repair to determine their intermediate-term results. Methods: The records of all patients who underwent an arthroscopic rotator cuff repair by the senior author (S.S.B.) between January 1, 2000, and December 31, 2003, were reviewed. Patients were excluded from the study if their rotator cuff was repaired but there was not a subscapularis tear. Forty patients were included in this study. The median follow-up from the date of surgery to the last clinical evaluation was 5.0 years (range, 3.2 to 7.1 years). All patients had a complete history, physical examination, and plain radiographs of their shoulders. Both the modified University of California at Los Angeles (UCLA) and American Shoulder and Elbow Society (ASES) scores were calculated. Results: The visual analog scale for pain (mean ± standard deviation) improved significantly (P < .001) from 6.1 ± 2.4 preoperatively to 0.9 ± 1.4 at the latest clinical follow-up evaluation; similarly, the mean modified ASES score improved significantly (P < .001) from 40.5 ± 15.7 preoperatively to 91.2 ± 12.7, and the mean modified UCLA score improved significantly (P < .001) from 15.7 ± 4.2 preoperatively to 31.6 ± 4.8. According to the UCLA scoring system, there were 18 excellent, 14 good, 6 fair, and 2 poor results. Eighty-three percent of patients returned to their usual work, sport, or hobbies after the operation. Conclusions: At a median follow-up of 5 years, 80% (32 of 40) of patients had a good or excellent result after an arthroscopic subscapularis tendon repair. Eighty-eight percent of patients were satisfied with their shoulders at the latest follow-up evaluation. We conclude that the intermediate-term results show that arthroscopic subscapularis tendon repairs remain a good option for the treatment of patients with subscapularis tendon tears. Level of Evidence: Level IV, therapeutic case series. Key Words: Arthroscopy—Repair—Rotator cuff—Shoulder arthroscopy—Subscapularis.

In 1834, Smith was credited as describing the first series of subscapularis tendon tears.1 More recently, there has been a renewed interest in understanding the subscapularis muscle. In just the past decade, there have been several articles dedicated to diagnosing and treating subscapularis tendon tears.2-14 As our understanding of the shoulder has increased, so has the rate at which subscapularis tendon tears have been identified.15 In the past, subscapularis tendon tears were thought of as uncommon,6,16,17 but today subscapularis tendon tears may be as common as infraspinatus tears.15 This increase in the detection of subscapularis tendon tears is directly related to advances in arthroscopic shoulder surgery and our understanding of the shoulder as a whole.15,18-20

Our understanding of subscapularis tendon tears has enabled us to know the incidence,15 given us the ability to preoperatively predict,15,18 and allowed us to properly repair subscapularis tendon tears.4 There have been several studies that have evaluated open5-7,17 and arthroscopic2-4,8,9,11 surgical techniques for repairing subscapularis tendon tears; however, most of these studies have reported short-term results. The purpose of this retrospective study was to evaluate patients after an arthroscopic subscapularis tendon repair to determine their intermediate-term results. Our hypothesis was that patients treated with an arthroscopic
subscapularis tendon repair would be satisfied with their shoulders at an intermediate-term follow-up.

**METHODS**

The records of all patients who underwent an arthroscopic rotator cuff repair performed by the senior author (S.S.B.) between January 1, 2000, and December 31, 2003, were reviewed. The minimum clinical follow-up for this study was 3 years. In this study, a subscapularis tear is defined as a complete tear of at least the upper 20% of the tendon. Patients were excluded from the study if their rotator cuff was repaired but there was not a subscapularis tear. Also, all patients with a previous history of shoulder surgery on the operative side were excluded from this study. No patients were excluded from this study for additional rotator cuff pathology or degenerative arthritis of the glenohumeral joint. After the exclusion criteria were met, there were 217 patients who had a primary arthroscopic subscapularis tendon repair performed by the senior author. All of these patients were invited by telephone to have a clinical follow-up evaluation. The senior author has a large referral practice. We drove across the state to set up a second follow-up site to increase the number of patients for follow-up; however, even with the second location, only 40 patients were able to attend the follow-up appointment. All patients gave informed consent to participate in this study and the study was approved by our institutional review committee.

All 40 of the patients had a complete retrospective review of their charts, including but not limited to all of their clinical appointments, diagnostic studies, and operative reports. At the follow-up appointments, the patients had both the modified University of California at Los Angeles (UCLA) and American Shoulder and Elbow Society (ASES) scores calculated. The patients were asked to list all of their current activities and state their satisfaction with their shoulders. The physical examination evaluated their active motion and graded their strength throughout their range of motion on a scale from 0 to 5 according to the Medical Research Council. In addition, all patients had the integrity of their subscapularis muscles evaluated with the lift-off, Napoleon, and bear-hug tests. All patients had 5 plain radiographs taken of their shoulders, including an anteroposterior view in the plane of the glenohumeral joint with the humerus in internal and external rotation; a 30° caudal tilt view; a supraspinatus outlet view; and an axillary view.

The median age at the time of surgery for the 40 patients in this study was 66 years (range, 13 to 81 years). There were 28 male and 12 female patients. The dominant shoulder was involved in 25 of the patients and the nondominant shoulder was involved in 15 of the patients. The median follow-up from the date of surgery to the last clinical evaluation was 5.0 years (range, 3.2 to 7.1 years). The median amount of time that had elapsed between the onset of shoulder symptoms and surgical intervention was 5 months (range, 1 to 156 months). The most common mechanism of injury to cause a subscapularis tendon tear was a fall onto the shoulder (38%), followed by no specific injury (30%), lifting something heavy (10%), and a motor vehicle collision (10%).

We repair all subscapularis tendon tears as described in detail by Burkhart et al. The tendon is often in a confined space that may be unfamiliar to the surgeon. As the case proceeds, soft tissue swelling often constricts this space even further. Therefore, repair of the subscapularis tendon before addressing any other pathology in the shoulder is recommended.

A subscapularis tendon tear often cannot be seen through a standard posterior viewing portal with a 30° arthroscope (Fig 1). A 70° arthroscope can improve the visualization through an “aerial view” (Fig 2) and enable the surgeon to diagnose some subscapularis tears that would not have been seen with a standard 30° arthroscope alone. Another useful maneuver is for the surgical assistant to apply the “posterior lever push.”
in which the assistant pushes the proximal humerus posteriorly while pulling the distal humerus anteriorly (Figs 3 and 4). This maneuver typically “opens up” the subcoracoid space and provides enough working area for the surgeon to diagnose and fix a subscapularis tendon tear.

The primary working portal is the anterosuperolateral portal, which is usually just anterior to the anterolateral corner of the acromion. The long head of the biceps tendon is often torn or displaced in patients who have a subscapularis tendon tear.15 Most of these patients are candidates for an arthroscopic biceps tenodesis to optimize their function and cosmesis.23 The subcoracoid space is measured with an instrument of known size (e.g., arthroscopic shaver) or calibrated probe. If there is evidence of subcoracoid stenosis (coracohumeral interval ≤ 6 mm), then a coracoplasty should be performed.24 The goal is to create an 8- to 10-mm coracohumeral interval, which is a healthy subcoracoid space that will improve the anterior working area for the subscapularis tendon repair and prevent future abrasion to protect the repair.

A 3-sided release is necessary for all complete, retracted subscapularis tendon tears. The key to safety when working around the coracoid is to stay lateral to the base of the coracoid. The soft tissue from the subscapularis footprint on the lesser tuberosity of the humerus is removed with electrocautery. A high speed burr then “removes the charcoal” (residual of electrocauterization) to a bleeding bone bed without decorticating the bone. If it is necessary to decrease the tension at the repair site, the subscapularis footprint

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**FIGURE 2.** The same shoulder shown in Fig 1 using 70° arthroscope. A standard posterior viewing portal with a 70° arthroscope evaluating the anterior aspect of the right shoulder. The visualization of the subscapularis tendon is enhanced with this “aerial view.” There appears to be disruption of the tendon at its insertion. (BT, long head of the biceps tendon; H, humeral head; SSc, subscapularis.)

**FIGURE 3.** Posterior lever push. The surgical assistant (SA) is applying the posterior lever push to the patient’s arm. The surgical assistant uses one hand to push posteriorly on the patient’s proximal arm while the surgical assistant’s other hand pulls anteriorly on the patient’s distal arm. This levering action results in a posterior displacement of the patient’s humeral head in relation to their glenoid. (1st, first assistant; S, surgeon.)

**FIGURE 4.** The same shoulder shown in Fig 1 using 70° arthroscope with posterior lever push. A standard posterior viewing portal with a 70° arthroscope evaluating the anterior aspect of the right shoulder. The surgical assistant is applying the posterior lever push to the same patient’s arm. After a thorough evaluation, the patient was diagnosed with a full-thickness tear of the cephalad 30% of his subscapularis tendon. The exposed subscapularis footprint (white hashed area) is quite evident at the 4 o’clock position of this picture. (H, humeral head; SSc, subscapularis.)
may be medialized up to 5 mm without any detriment to its function. One anchor should be placed for every 1 linear centimeter of torn tendon in a cephalad to caudal direction. Because the length of the subscapularis tendon insertion is approximately 2.5 cm, typically a single anchor should be placed for a tear that comprises up to 50% of the tendon torn and 2 anchors for a tear greater than 50% of the tendon torn.

The sutures for each anchor are “tied as you go” from caudal to cephalad. The caudal anchor’s sutures are passed and tied approximately 10 mm medial to the lateral edge of the subscapularis tendon. The cephalad anchor’s sutures are passed over the top of the superolateral border of the subscapularis, just medial to the “comma tissue,” to provide a “rip stop” to prevent lateral cutout of the sutures (Fig 5). Every knot is tied as an arthroscopic surgeon’s knot, which is composed of 3 stacked half-hitches followed by 3 reversing half-hitches on alternating posts. Upon completion of the subscapularis tendon repair, the arm is internally and externally rotated to ensure secure apposition of the tendon against the bone (Fig 6).

All patients have a sling with a small pillow applied in the operating room. The sling is worn full-time for 6 weeks, except when showering or eating. During the first 6 weeks, patients are instructed to perform active elbow flexion and extension with the arm at the side. It is imperative that the patient not externally rotate past neutral (straight ahead position) for the first 6 weeks. At 6 weeks from the date of surgery, the patient may discontinue use of the sling.

The patient then begins a passive stretching program that includes passive external rotation with a cane out to 45° and overhead stretches with a rope and pulley. At 12 weeks, the patient starts a strengthening program with elastic bands. If the subscapularis tear was part of a massive anterosuperior rotator cuff tear, then strengthening is delayed until 16 weeks after surgery. The progression to light weights is based on the patient’s progress. The rehabilitation program is focused on the scapular stabilizers, deltoïd, and rotator cuff. The return to full, unrestricted activities is usually 6 to 12 months postoperatively and is based on the patient, initial tear size, strength of the repair, and the patient’s rehabilitation progress.

Case summary results were presented using means ± standard deviations or medians with data ranges as appropriate. Statistical testing was performed comparing preoperative measures with corresponding minimum 3-year follow-up measures. Parametric tests were used for angle measures and outcome scores. Nonparametric tests were used for strength measures and diagnostic tests. Postoperative data were recorded for all 40 cases, and any association between the postoperative measures and patient age, time to follow-up, time from onset of symptoms to surgical intervention, and length of subscapularis tendon tear (expressed as a percentage) was analyzed using Pearson or Spearman correlations. Preoperative active el-
evation angle was available for all 40 cases, and 38 cases had preoperative visual analog scale pain scores and UCLA scores, so paired Student t tests were performed for these measures. Thirty-eight cases had preoperative external rotation strength, so the Wilcoxon matched pairs signed ranks test was used for this measure. Other preoperative data measures were missing for a considerable number of cases, so to avoid excluding the cases with missing preoperative data, unpaired Student t tests or Mann-Whitney U tests (for strength measures) were performed to compare the observed preoperative and postoperative data distributions. For parameters analyzed in this fashion, preoperative missing counts were 8 cases for active external rotation angle, 12 cases for ASES score, 20 cases for elevation strength, 21 cases for active internal rotation, and 27 cases for internal rotation strength. For all statistical tests, P < .05 was considered significant. Statistical analyses were performed using SPSS software (version 15.0; SPSS, Chicago, IL).

RESULTS

The subscapularis tendon was torn a median of 50% of the total length of the tendon from cephalad to caudal (range, 20% to 100%). The subscapularis tendon tear was part of a massive rotator cuff tear, defined as complete tears of at least 2 rotator cuff tendons, in 83% of the patients. There were 7 iso-

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RESULTS

The subscapularis tendon was torn a median of 50% of the total length of the tendon from cephalad to caudal (range, 20% to 100%). The subscapularis tendon tear was part of a massive rotator cuff tear, defined as complete tears of at least 2 rotator cuff tendons, in 83% of the patients. There were 7 isolated subscapularis tendon tears in this study. The long head of the biceps tendon was torn, subluxated, or dislocated in 63% of the patients. Forty-three percent of the patients had subcoracoid impingement and required an arthroscopic coracoplasty. Four patients had an arthroscopic SLAP repair in addition to their rotator cuff repair; 1 of these patients also required an arthroscopic Bankart repair. One patient at the time of the initial surgery required an arthroscopic posterior capsular release secondary to a significant preoperative restriction in internal rotation. There were no surgical complications and no revision surgeries in this study. A summary of operative findings can be found in Table 1.

The mean active elevation and internal rotation improved significantly postoperatively (P < .001), while the mean active external rotation decreased significantly (P = .030). The mean elevation, external rotation, and internal rotation strength improved significantly postoperatively for all measures (P < .001). Age at time of surgery was significantly negatively correlated with postoperative measures of elevation (ρ = −0.49; P = .001), elevation strength (ρ = −0.44; P = .005), external rotation strength (ρ = −0.59; P < .001), and internal rotation strength (ρ = −0.37; P = .017). Table 2 shows the complete details of the physical examination.

Only 6 lift-off and 3 bear-hug tests were done preoperatively, while the Napoleon test was performed in 24 of the 40 patients. Of the 24 patients who had a Napoleon test, there were 7 patients who could completely perform the test (negative test result), 14 patients who were rated as intermediate, and 3 patients who could not perform the Napoleon test (positive test result). At the latest clinical examination, all 3 tests were administered. The Napoleon test was completely performed (negative test result) in 31 patients, intermediate in 7 patients, and 2 patients were unable to perform (positive test result) the test, representing a significant improvement over the preoperative results (P < .001). The postoperative results of the Napoleon test were influenced by the length of the subscapularis tendon tear. In patients with a negative Napoleon test, the mean ± standard deviation of tear length was 49 ± 21%, which was significantly lower than the mean of 68 ± 24% observed for patients with an intermediate or positive test (P = .033).

Overall, visual analog scale scores for pain improved significantly (P < .001) by a mean difference of 5.2 ± 2.8 from 6.1 ± 2.4 preoperatively to 0.9 ± 1.4 at the latest clinical follow-up evaluation. The modified ASES score improved significantly (P < .001) from a mean of 40.5 ± 15.7 preoperatively to the follow-up mean of 91.2 ± 12.7. The modified UCLA score improved significantly (P < .001) by a mean difference of 15.8 ± 5.9 from 15.7 ± 4.2 preoperatively to 31.6 ± 4.8. According to the UCLA

| Percentage of subscapularis tendon torn (cephalad to caudal) | 53.5% (range, 20% to 100%) |
| Part of a massive rotator cuff tear | 83% (33 of 40) |
| Partial LHBT tear | 15% (6 of 40) |
| Complete LHBT tear | 13% (5 of 40) |
| LHBT subluxation or dislocation | 38% (15 of 40) |
| LHBT tear, subluxation, or dislocation | 63% (25 of 40) |
| Arthroscopic coracoplasty | 43% (17 of 40) |
| Arthroscopic acromioplasty | 95% (38 of 40) |
| Arthroscopic distal clavicle excision | 33% (13 of 40) |
| Additional shoulder pathology addressed at initial surgery | 13% (5 of 40) |

Abbreviation: LHBT, long head of biceps tendon.
scoring system, there were 18 excellent, 14 good, 6 fair, and 2 poor results. Eighty-eight percent of patients were satisfied with their shoulders at the latest follow-up evaluation. Eighty-three percent of patients returned to their usual work, sport, or hobbies after the operation. None of the outcome measures was significantly associated with age, follow-up time, symptom duration, or tear length. The majority of patients are involved in strenuous activities that test the functional capacity of their shoulders daily. Table 2 shows the outcome measure results.

Although the sample of 40 patients had sufficient power to detect preoperative to postoperative improvements in patient functionality with statistical significance, the observed satisfaction rate of 88% had a wide 95% confidence interval of 73% to 96%. As a result, a power analysis was performed assuming the observed 5-year postoperative satisfaction rate of 88% was true for the population of patients with arthroscopic subscapularis tendon repairs. A sample of 80 patients would be necessary to detect the satisfaction rate as significantly different from 75% by binomial test with $P < .05$ and power of 80%.

**DISCUSSION**

There have been several articles published on the open surgical treatment of subscapularis tendon tears.5,7,10,14,17,27 Gerber et al.7 evaluated 16 patients with a mean age of 50 years who had a traumatic isolated subscapularis tendon tear repaired with an open surgical technique. The mean follow-up in their study was approximately 3.6 years with 8 excellent, 5 good, 1 fair, and 2 poor results. Deutsch et al.5 evaluated 14 patients with a mean age of 39 years who had a traumatic isolated subscapularis tendon tear repaired with an open surgical technique. The mean follow-up in their study was 2 years with limited results reported, although the authors noted that 12 of 13 patients returned to their previous sports activities.

Warner et al.17 evaluated 19 patients with a mean age of 58 years who had anterosuperior rotator cuff tears, which are tears of at least the subscapularis and supraspinatus tendons. The mean follow-up in their study was approximately 3.3 years with 5 excellent, 3 good, 4 fair, and 7 poor results. However, it should be noted that 9 of the patients had a failed previous rotator cuff repair on the same shoulder. In a more recent study, Flury et al.6 evaluated 63 patients with a mean age of 56 years who had either anterosuperior or isolated subscapularis tendon tears repaired with an open surgical technique. The mean follow-up in their study was 2 years with limited results reported, although the authors noted that 12 of 13 patients returned to their previous sports activities.

There have also been several articles published on the arthroscopic surgical treatment of subscapularis tendon tears.2,4,8,9,11 Kim et al.9 evaluated 29 patients with a mean age of 54 years who had isolated partial articular surface tears of the subscapularis tendon re-
paired with an arthroscopic surgical technique. The mean follow-up in their study was 2.3 years with 18 excellent, 10 good, and 1 fair result. More recently, Lafosse et al.\textsuperscript{11} published a prospective study on 17 patients with a mean age of 47 years who had isolated tears of the subscapularis tendon repaired with an arthroscopic surgical technique. The mean follow-up in his study was approximately 2.4 years with 12 patients very satisfied, 4 satisfied, and 1 not satisfied with the result at the latest follow-up examination.

In a study by Burkhart et al.,\textsuperscript{4} the authors were the first to describe the technique and preliminary results of arthroscopic repair of the subscapularis tendon. The study evaluated 25 patients with a mean age of 61 years who had either anterosuperior or isolated subscapularis tendon tears repaired with an arthroscopic surgical technique. The mean follow-up in the study was 10.7 months with 23 good to excellent results, 1 fair, and 1 poor result. More recently, Ide et al.\textsuperscript{8} published the results of their study which consisted of 20 patients with a mean age of 62 years who underwent arthroscopic repair of anterosuperior rotator cuff tears. The mean follow-up in their study was 3 years with 13 excellent, 5 good, 1 fair, and 1 poor result.

The present study evaluated 40 patients with a mean age of 63 years who had either anterosuperior or isolated subscapularis tendon tears repaired with an arthroscopic surgical technique. There were a total of 33 anterosuperior rotator cuff tears and 7 isolated subscapularis tendon tears. The mean follow-up in this study was 5.0 years. Therefore, this investigation represents the largest study with the longest follow-up of all the articles published on arthroscopic subscapularis tendon repairs. There were statistically significant improvements in both the ASES (40.5 to 91.2) and UCLA (15.7 to 31.6) scores at the latest follow-up evaluation. According to the UCLA scoring system there were 18 excellent, 14 good, 6 fair, and 2 poor results. Eighty-eight percent of patients were satisfied with their shoulders at the latest follow-up evaluation. Of the 6 patients with a fair result, 3 had significant glenohumeral degenerative changes seen on their radiographic films at the latest follow-up evaluation, while both of the patients with poor results had significant glenohumeral degenerative changes seen on their plain films at the latest follow-up evaluation. We suspect that these degenerative changes were at least partly responsible for downgrading the results in these patients.

The rate of biceps tendon tears, subluxations, or dislocations in this study was 63%. This is consistent with the rate of biceps involvement in other studies that have addressed subscapularis tendon tears confirmed with arthroscopy.\textsuperscript{5,13,15,20} However, in shoulders with arthroscopically-confirmed rotator cuff tears but no subscapularis tendon tears, the rate of biceps tendon tears, subluxations, or dislocations is only 19%.\textsuperscript{15} This point emphasizes the intimate relationship between the long head of the biceps tendon, medial sling of the biceps, and subscapularis tendon insertion. The subscapularis tendon normally inserts into the lesser tuberosity of the humerus; however, it also has attachments on its undersurface to the glenohumeral joint capsule and distally it interdigitates with the fibers of the medial sling of the biceps.\textsuperscript{28} A detachment of the subscapularis tendon insertion is typically accompanied by disruption of the medial sling at its insertion, which results in subluxation or dislocation of the biceps tendon.\textsuperscript{24} Therefore, subluxation or dislocation of the long head of the biceps tendon appreciated preoperatively should alert the physician that a subscapularis tendon tear may be present.

Forty-three percent of the patients in this study required an arthroscopic coracoplasty to increase the subcoracoid space. The normal subcoracoid space has been determined through anatomic and imaging studies to have a coracohumeral distance, or distance between the coracoid tip and proximal humerus, of between 8.4 and 11 mm.\textsuperscript{29,30} Richards et al.\textsuperscript{31} determined that a narrowed coracohumeral distance is associated with subscapularis tendon tears. Furthermore, most subscapularis tendon tears are degenerative in nature and may result from tensile undersurface fiber failure (TUFF).\textsuperscript{24} In this situation, the subscapularis tendon drapes over a prominent coracoid tip and there are significant tensile forces to the fibers of the articular or undersurface of the subscapularis tendon. The prominent coracoid and associated TUFF lesion may ultimately result in articular-sided tearing, which is a consistent finding seen in partial subscapularis tendon tears.\textsuperscript{32} It is therefore recommended that in patients with subcoracoid stenosia, or a coracohumeral distance less than 6 mm, a coracoplasty should be done with a goal of obtaining an 8 to 10 mm coracohumeral distance.\textsuperscript{22} This not only increases the subcoracoid working space to perform the arthroscopic repair but also serves to protect the repair after it is done.

In this study, the amount of time that had elapsed between the onset of shoulder symptoms and surgical intervention was 12.4 months (range, 1 to 156 months). In 15 of the 40 patients the symptom duration was greater than 12 months. A delay in identifying and referring a patient with a subscapularis tendon tear to the appropriate surgeon is not uncommon in the literature.\textsuperscript{4,5,30} However, as the amount of time between the
onset of symptoms and surgical intervention increases, the chance of a successful outcome decreases.\textsuperscript{7,10,17} This is not to say that patients with long-standing subscapularis tendon tears should not be repaired, because the subscapularis may have a tenodesis function that may be restored by repairing the tendon to bone even in the face of poor muscle quality.\textsuperscript{4} Furthermore, in this study the patient with the longest symptom duration (13 years) had a good functional outcome with overall satisfaction with his shoulder.

The most obvious weakness of this study was the retrospective collection of the data. Also, only 40 of 217 (18\%) potential patients were included in this study. This introduces the possibility of inclusion bias. All 217 patients were invited and encouraged to attend the follow-up appointment. However, given the senior author’s large geographic referral practice, it was very difficult for most of the patients to attend the follow-up appointment. We did set up a second satellite clinic across the state to capture more patients; however, only 40 patients were seen between the 2 clinics. There was also a lack of sufficient preoperative data on the lift-off and bear-hug tests. In addition, we were not able to evaluate the actual preoperative plain films to determine the incidence of proximal migration of the humerus before arthroscopic repair. Therefore, we could not determine in this paper if an arthroscopic rotator cuff repair could reverse proximal migration of the humerus that was seen in a previous study.\textsuperscript{4} Another potential weakness of this study was that there were only 7 isolated subscapularis tendon tears, which resulted in the majority (83\%) of patients in this study having massive anterosuperior rotator cuff tears. However, the fact that most of these patients were doing quite well at the latest clinical evaluation emphasizes the generally good outcomes of massive anterosuperior rotator cuff tears treated with an arthroscopic repair.

**CONCLUSIONS**

At a mean follow-up of 5 years, 80\% (32 of 40) of patients had a good or excellent result after an arthroscopic subscapularis tendon repair. Eighty-eight percent of patients were satisfied with their shoulders at the latest follow-up evaluation. We conclude that the intermediate-term results show that arthroscopic subscapularis tendon repairs remain a good option for the treatment of patients with subscapularis tendon tears.

**REFERENCES**


