Accelerated Rehabilitation After Arthroscopic Bankart Repair for Selected Cases: A Prospective Randomized Clinical Study

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Purpose: Increased stress within a certain limit enhances ligament healing and improves joint function. In this prospective randomized clinical trial, we compared the clinical results of early motion versus conventional immobilization after arthroscopic Bankart repair in a selected patient population. **Type of Study:** Prospective randomized clinical trial. **Methods:** We performed an arthroscopic Bankart repair using suture anchors in 62 patients with traumatic recurrent anterior instability of the shoulder. Patients were randomized into 2 groups; group 1 (28 patients; mean age, 28 years) was managed with 3 weeks of immobilization using an abduction sling and conventional rehabilitation program, and group 2 (34 patients; mean age, 29 years) was managed with an accelerated rehabilitation program that consisted of staged range of motion and strengthening exercises from the immediate postoperative day. Selection criteria were nonathletes with recurrent anterior shoulder dislocation and a classic Bankart lesion with a robust labrum limited to 1 cm from the midglenoid notch. The patients were followed up for a mean of 31 months (range, 27 to 45 months; standard deviation, 9 months). Analysis of outcome included pain scores at 6 weeks and at final follow-up evaluation, range of motion, return to activity, recurrence rate, patient satisfaction with each rehabilitation program, and shoulder scores assessed by the American Shoulder and Elbow Surgeons Shoulder Index, the rating system of the University of California at Los Angeles, and another scoring system. **Results:** The recurrence rate was not different between the 2 groups ($P = .842$). None of the groups developed recurrent dislocation. Two patients from each group were positive for anterior apprehension signs. Patients who underwent accelerated rehabilitation resumed functional range of motion faster ($P < .001$) and returned earlier to the functional level of activity ($P < .001$). Accelerated rehabilitation decreased postoperative pain ($P = .013$), and more patients were satisfied with this program ($P < .001$). Shoulder scores, return to activity, pain score, and range of motion were not different between the 2 groups at the final follow-up evaluation ($P > .05$). **Conclusions:** Early mobilization of the operated shoulder after arthroscopic Bankart repair does not increase the recurrence rate in a selected group of patients. Although the final outcomes are approximately the same for both groups, the accelerated rehabilitation program promotes functional recovery and reduces postoperative pain, which allows patients an early return to desired activities. **Key Words:** Instability—Shoulder—Bankart repair—Arthroscopy—Rehabilitation.

Immobilization, either with a soft sling or a hard brace, has been a routine modality after most surgical procedures for shoulder instability. The immobilization period after open Bankart repair ranges from 2 days to 5 weeks in the literature.[1-6] It permits time for the repaired tissues to heal and may enhance scar formation in the surrounding tissues of shoulder, which can be beneficial for shoulder stability. However, Rowe et al.[5] suggested that early motion, within 2 or 3 days, was the key for full range of motion and return to full participation in sports. In the modified Bankart reconstruction using suture anchors, early mobilization resulted in successful initial outcomes.[3]

Immobilization in the arthroscopic Bankart repair was prolonged, ranging from 3 to 6 weeks.[1,7-14] The reason for this prolongation was an increased recurrence rate with the early arthroscopic technique.[8-10,14]

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A recent arthroscopic repair using suture anchors provided more secure repair of the capsulolabral tissue to the anterior glenoid than the early transglenoid repair technique.[7,13,15] The suture anchor technique is considered to be safer for postoperative rehabilitation. Furthermore, because arthroscopic repair provokes little inflammatory responses in the surrounding tissues, more extended immobilization than necessary may not provide benefit for shoulder stability. However, most of the current regimens for arthroscopic suture anchor repair still incorporate prolonged immobilization with various types of shoulder braces. Such immobilization was not documented as beneficial for the healing of repaired tissues or for the reduction of the instability recurrence rate.[7,13,15,16]

To answer this fundamental question of whether immobilization is essential after arthroscopic Bankart repair using suture anchors, we undertook a prospective, randomized clinical study to compare the results of accelerated rehabilitation versus conventional immobilization in a selected group of patients. Specifically, we addressed the following research questions: (1) does early motion increase the recurrence rate of shoulder instability, and (2) does an accelerated rehabilitation program promote functional return and decrease morbidity?

METHODS

Patient Selection

The primary target groups of patients were the best candidates for arthroscopic repair of Bankart lesions. To control variability, inclusion criteria were strictly adhered to. From January 1997 to June 1998, all patients with a diagnosis of recurrent shoulder instability at our institution were asked to enroll in this study if they met the following criteria: (1) the patient had a traumatic unidirectional anterior instability in 1 shoulder, (2) the type of instability was recurrent dislocation, (3) the patient was not actively participating in any sports, (4) the affected shoulder had a classic Bankart lesion with a healthy labrum, and (5) the Bankart lesion was limited to 1 cm above the midglenoid notch. This group would be expected to be less dependent on immobilization than patients with more extensive labral detachment or capsular laxity.

Recurrent dislocation was defined as having had more than 1 episode of instability, which needed manual reduction by other people. We defined active participation in sports as in any type of sports performed for more than 5 hours a week or contact sports regardless of the magnitude of participation. Any collegiate or professional level sports player was also considered to be an active participant.

We excluded patients with acute initial instability, a bony Bankart lesion, multidirectional or posterior instability, glenohumeral or generalized ligamentous laxity, anterior glenoid defect greater than 30% of the glenoid circumference, or any associated lesion, such as a partial- or full-thickness rotator cuff tear, articular lesion, unstable superior labral lesion, or previous surgery. Glenohumeral laxity was defined as having more than a grade 1 sulcus sign. The sulcus sign test was performed with the patient in a standing position. A downward traction force was applied to the adducted shoulder and the inferior translation of the humerus was measured by estimating the distance between the inferior margin of lateral acromion and the humeral head. Grade 0 was equivalent to no movement: grade 1, less than 1 cm; grade 2, 1 to 2 cm; and grade 3, more than 2 cm. Generalized ligamentous laxity was defined if the patient had at least 2 of the following signs: thumb-to-forearm distance less than 4 cm; index metacarpophalangeal extension in excess of 90°; or elbow hyperextension, knee hyperextension, or patellar hypermobility.

Participation in the study was entirely voluntary. All patients were provided with an explanation of the purpose of the study and an opportunity to ask questions. They were assured that nonparticipation or withdrawal would not jeopardize their care. The Institutional Review Board of our center approved the study, and each patient signed a detailed informed consent form. The patients agreed to be blinded with regard to which protocol of rehabilitation was new to reduce bias in their responses on the follow-up questionnaires.

Seventy-one patients met the selection criteria for the study. Five patients declined to participate. Four patients could not finish the final evaluation because of personal reasons unrelated to the shoulder. We excluded these 4 patients although they did not show differences from the entire group population in the majority of the demographic data. Therefore, this study included 62 patients who completed the required evaluations and analyses.

Sample Size Calculation

To determine the appropriate sample size for each group, we used a statistical program (nQuery Advisor 3.0, Statistical Solutions, Cork, Ireland), that incorporated difference of means. Because the primary goal of the study was to evaluate whether the accelerated rehabilitation program increased recurrence of instability after arthroscopic Bankart repair in selected patients, the null hypothesis (Ho) was that an accelerated rehabilitation program increased the recurrence rate compared with conventional rehabilitation (Ho: $R_{\mu 2} > R_{\mu 1}$). With a 0.05 two-sided significance level and 80% power, we postulated that the expected difference in means of recurrence after arthroscopic repair between the 2 groups would be 5.0%, with common standard deviation (SD) of 6.0%. Assuming that the paired *t* test was used, a sample size of each group was determined to be 23 patients.

Randomization Procedures

After completion of the arthroscopic repair of the Bankart lesion, each patient was assigned to 1 of the 2 groups of the rehabilitation programs by a randomization procedure. One of the circulating nurses in the operating room opened a randomly selected envelope that contained 1 of the 2 numbers (1 or 2). This randomization method could negate the selection bias by the surgeon. Group 1 received the routine conventional rehabilitation program and group 2 an accelerated program.

Radiographic Evaluation

All patients underwent preoperative radiographs including anteroposterior, axillary, and Stryker notch views. The magnetic resonance image (MRI) arthrogram was performed with a 1.5-T scanner (Simens, Munich, Germany) in all patients. The images were obtained on the usual section and sequence. All radiographic measurements were performed on the PACS (Picture Archiving Communication System, GE, Munich, Germany; pixels: 2048 × 1536) monitor, which could automatically measure a length to 2 decimal points.

Examination Under Anesthesia

Examination under anesthesia was performed with patients in the lateral decubitus position. With the arm in 90° of abduction, anteroposterior humeral translation was rated as grade 0 (no translation), grade 1 (translation less than the margin of glenoid), grade 2 (translation beyond the margin of glenoid with spontaneous reduction), or grade 3 (translation beyond the glenoid without spontaneous reduction).[17]

Arthroscopic Evaluation

During arthroscopy, we systematically examined the joint to evaluate the condition and the size of the anterior labrum, evidence of rotator cuff pathology, loose bodies, biceps tendon, capsular laxity, and articular lesions. Any patients with major abnormalities other than the Bankart and Hill-Sachs lesions were excluded from the study. The anterior labrum of the Bankart lesion was classified into 3 groups. Type 1 included a lesion with discrete labral tissue with a thickness greater than half of the other part of the labrum (Fig 1); type 2, cases in which thickness of the labral tissue was less than half; and type 3, in which no discernible labral tissue was noted while preparing the capsular tissue in the anteroinferior aspect of the glenoid. Patients with type 2 or 3 anterior labrum were excluded from the study.

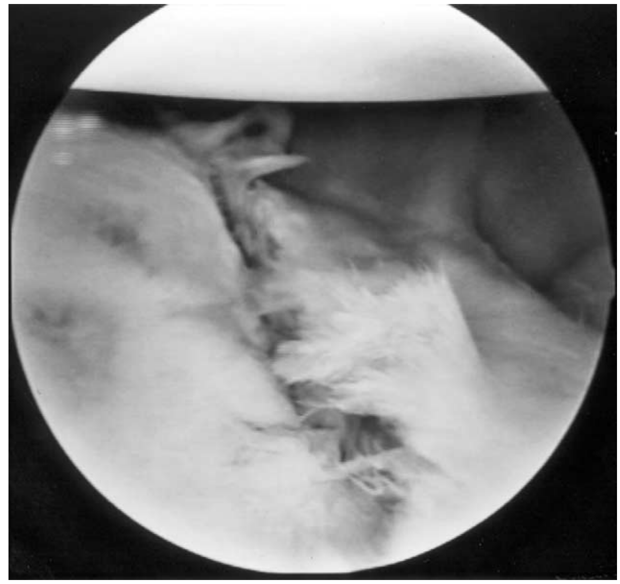

FIGURE 1. Arthroscopic finding showing type 1 labrum of the Bankart lesion and the thick anterior band of the inferior glenohumeral ligament. Left shoulder viewing from the anterosuperior portal.

The extent of the anterior glenoid defect was measured by direct visualization. The glenoid was divided into 4 quadrants by an imaginary vertical line drawn from the 12-o'clock to the 6-o'clock positions and a transverse line at the midglenoid notch. Each quadrant comprised approximately 25% of the glenoid circumference. We excluded patients with glenoid defects that extended up to more than 1 cm above the midglenoid notch, which was approximately 30% of the circumference.

The Hill-Sachs lesion was classified as a large bony defect, superficial bony lesion, and cartilage scuffing. The type of Hill-Sachs lesion was not used as a selection criterion. Capsular laxity was evaluated by direct visualization and palpation with a probe. The presence of the thick band in the anteroinferior aspect of the capsule was considered to signify a competent capsule. The drive-through sign was also an indication of capsular laxity. Patients with capsular laxity were also excluded from the study.

Arthroscopic Procedure

One surgeon performed all the arthroscopic procedures. The lateral decubitus position was used. We created standard posterior, anterosuperior, and midglenoid portals. Both anterosuperior and midglenoid portals were created using the inside-out technique. Looking from the anterosuperior portal, the capsulolabral tissue was mobilized from the anterior glenoid surface using a Liberator knife (Linvatec, Largo, FL) and light decortication was performed using a meniscal rasp. With 2-mm pituitary forceps, small pilot markings were created on the margin of the anterior glenoid rim. With a bone punch, a screw hole was placed as perpendicular as possible, with the most inferior screw hole near the 6-o'clock position. This was performed by keeping the tip of the bone punch in the pilot marking and pivoting the shaft of the bone punch inferiorly and laterally. This perpendicular orientation of the screw hole can reduce the incidence of screw penetration of the inferior glenoid cortex, which often occurs when drilling a screw hole with a power drill. A mini-Revo screw (Linvatec) with a No. 2 Ethibond suture (Ethicon, Somerville, NJ) was manually inserted into the hole. At the final turn of the screw handle, the orientation of the eyelet of the screw was arranged parallel to the future suture direction to reduce the friction between the suture material and the screw. Using the suture hook loaded with the Shuttle-Relay (Linvatec), a capsular suture was created about 1 cm inferior to the anchor and at or below the level of the glenoid surface. The suture hook, with the capsular tissue, was shifted proximally to the point of the suture anchor, and then the suture hook was passed under the labrum. This eliminated a redundant pouch anterior to the glenoid wall. One end of the suture was engaged into the eyelet of the Shuttle-Relay and then pulled back out. Finally, an arthroscopic sliding knot (SMC knot[18,19]) was created (Fig 2).

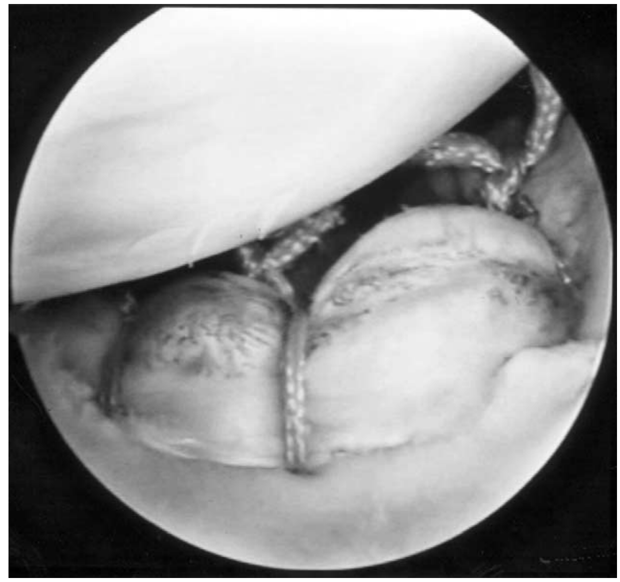

FIGURE 2. Postoperative finding after arthroscopic repair of the Bankart lesion. Three suture anchor repairs secured the Bankart lesion and the restored anterior labral buttress. Left shoulder viewing from the posterior portal.

Postoperative Rehabilitation Protocol

For group 1, after surgery was completed, the shoulders were immobilized for 3 weeks using a sling with a pillow spacer. The sling allowed the shoulders 20° of abduction and 40° of internal rotation. During this period, the patients were allowed to flex their elbows and wrists intermittently and to wash the axilla daily. After 3 weeks, gentle pendulum exercise and a progressive active-assisted forward elevation exercise using a rope and pulley were initiated. At 4 weeks, internal rotation strengthening exercise began with a light rubber band, progressing to a heavier one. However, external rotation was strictly prohibited during this period. After 6 weeks, external rotation with a bar and external rotation strengthening using a rubber band were initiated. The rate of progression was controlled only by the patients. After 9 weeks, patients were encouraged to perform more vigorous cuff strengthening exercises, including diagonal direction strengthening.

For group 2, the rehabilitation protocol is summarized in Table 1. The patients used a sling during sleep for the first 2 weeks and initiated gradual exercise from the first postoperative day. Forward elevation was maintained at 90° during the first 2 weeks. On the fourth week, full range of motion was allowed as tolerated, except for extreme external rotation. All range of motion and strengthening exercises were performed at subpainful conditions.

Clinical Assessment

A single examiner who was unaware of the research protocol assessed all patients. The patients were fol-

TABLE 1. *Accelerated Rehabilitation Program*

Time	Exercises
Phase I: Protection phase (weeks 1-5)	
Day 0: Rest with a sling, sleep in a sling for 2 weeks	
Day 1: Pendulum with 10° forward leaning	
Day 3: Submaximal isometric exercises	
PROM* and AAROM† exercises to tolerance: Forward elevation and internal rotation (rope & pulley/bar)	
Day 7: Forward elevation to 90°	
Week 2	
PROM, AAROM forward elevation to 90°, external rotation at side to 20°	
Isotonic internal rotation exercises: Arm at the side initiating at neutral rotation (light rubber band)	
Week 3	
PROM, AAROM forward elevation to tolerance, external rotation at 30° of abduction to 20°	
Week 4	
Permit full range of motion to tolerance, except extreme abduction and external rotation	
Isotonic strengthening exercises for external rotation at side and forward elevation	
Week 5	
External rotation at 90° of abduction to tolerance	
Phase II: Dynamic strengthening phase (weeks 6-12)	
Weeks 6-9	
Continue range-of-motion exercises	
Isotonic dumbell exercises for internal and external rotator, deltoid, supraspinatus	
Diagonal strengthening (rubber band)	
Weeks 10-12	
Tubing exercises in 90/90 position	
Isotonics for trunk muscles	

*Passive range-of-motion.
†Active assisted range-of-motion.

lowed up for a mean of 31 months (range, 27 to 45 months; SD, 9 months). We compared recurrence rate, shoulder scores, pain, range of motion, return to activity, and patient satisfaction with the rehabilitation program.

We defined the recurrence of instability as redislocation or subluxation during the follow-up period or positive anterior apprehension test results at final follow-up evaluation even without a history of redislocation or subluxation. The clinical assessment consisted of a structured interview, a detailed physical examination, and completion of the University of California at Los Angeles,[20] Rowe et al.[5], and the modified version of the American Shoulder and Elbow Surgeons Standard Evaluation[21] scores. A visual analog scale was used to determine the severity of pain during daily activities on the sixth week and at the final follow-up evaluation. The shoulder motion was measured with a handheld goniometer including forward elevation, external rotation with the arm at the side and at 90° of abduction, and internal rotation with the adducted arm.

To evaluate the speed of recovery after the surgery, we measured the time required for recovery of shoulder motion and patients' subjective perceptions of shoulder function. Each patient was asked to rate current function of the affected shoulder as a percentage of its preinjury level, before and after surgery, using a visual analog scale. The patients were taught how to measure the external rotation with the arm at the side using a hand held goniometer and how to use the visual analog scale for shoulder function. External rotation range and shoulder function were recorded on the progress sheet once a week at home. We calculated the time needed for the external rotation with the arm at the side to resume 90% of the final range and the time for returning to 90% of the final level of shoulder function instead of the time of the final level itself. This 90% of the final level would be a more practical method to measure the speed of activity return because the majority of patients were able to participate in the same activity as the final level and the progression to 90% was linear.

Each patient was asked about their satisfaction with the rehabilitation program, including wearing braces, 1 year after surgery. The patient satisfaction ratings were divided into 3 groups: satisfactory, good, and unsatisfactory.

TABLE 2. *Preoperative Data*

Variable	Group 1*	Group 2*
No. of patients	28	34
Age (yr)	28 ± 5.6 (18-39)	29 ± 5.8 (15-38)
Sex	men, 23; women, 5	men, 27; women, 7
Sports participation	15 (54%)	20 (59%)
Number of dislocation	7 ± 4 (2-20)	9 ± 5 (2-26)
Time from injury to surgery (mo)	42 ± 16 (13-84)	39 ± 17 (9-92)
Anterior translation		
Grade 2	8	6
Grade 3	20	27
Size of Hill-Sachs lesion†		
Large bony defect	16	21
Superficial bony lesion	8	7
Cartilage scuffing	4	6
Glenoid defect		
0%	11	18
1%-10%	6	8
11%-20%	7	5
21%-30%	4	3
Preoperative scores (points)		
UCLA	18.5 ± 2.4 (13-22)	18.7 ± 2.3 (14-23)
ASES	49.3 ± 8.8 (36-67)	49.6 ± 5.7 (40-66)
Rowe	22.7 ± 8.7 (10-40)	23.8 ± 7.9 (10-40)
Preoperative level of activities (%)	33 ± 10 (20-50)	34 ± 11 (10-50)

*The values are given as the number of patients unless otherwise indicated.
†Arthroscopic finding.

Statistical Analysis

The Mann-Whitney *U* test was used to evaluate any difference in recurrence, activity return, shoulder score, pain score, and patient satisfaction between the 2 groups. Independent sample *t* test was used to determine any differences between the 2 groups in the times for returning to 90% of the final activity and times for resuming 90% of external rotation. The Wilcoxon signed-rank test was used to assess any differences between the preoperative and postoperative shoulder scores. The SPSS program (SPSS, Chicago, Illinois) was used for all analysis, with alpha level set at 0.05.

RESULTS

Patient Demographics

Demographic data for the 2 groups were similar with regard to age, gender, sports participation, number of dislocation, time from injury to the surgery, size of the Hill-Sachs lesion, condition of the anterior labrum, preoperative shoulder scores, and preoperative activity level ($P > .05$) (Table 2). Group 1, the conventional rehabilitation group, included 28 patients. The mean patient age was 28 years (range, 18 to 39; SD, 5.6 years). Group 2, the accelerated rehabilitation group, included 34 patients. The mean age was 29 years (range, 15 to 38; SD, 5.8 years).

Recurrence

No recurrent dislocation or subluxation was noted in either group. Two patients from each group had positive anterior apprehension test results at the follow-up evaluation. The recurrence rate was not different between the 2 groups (group 1, 7.1%; group 2, 5.9%; $P = .842$). Therefore, the null hypothesis, which assumed an increased recurrence rate in an accelerated rehabilitation group (Ho: $R_{\mu 2} > R_{\mu 1}$) was rejected (Table 3).

Shoulder Scores

All shoulder scores were improved after surgery in both groups. However, no significant difference was seen in any of the shoulder scores between the 2 groups ($P > .05$). According to the scoring system of the University of California at Los Angeles, 26 patients from group 1 and 32 from group 2 had satisfactory results. Two patients from each group had fair results. Applying the scoring system of Rowe et al., 24

TABLE 3. *Results at the Follow-up*

Variable	Group 1*	Group 2*	*P* Value
No. of patients	28	34	
Recurrence	2 (7.1%)	2 (5.9%)	.842
Mean shoulder score (points)			
UCLA	32.4 ± 2.5 (27-35)	32.7 ± 2.2 (27-35)	.783
ASES	88.0 ± 7.7 (70-98)	88.1 ± 8.9 (70-96)	.337
Rowe	90.5 ± 10.7 (55-100)	91.9 ± 9.9 (55-100)	.392
Pain score (points)			
Six weeks	1.5 ± 1.1 (0-4)	0.9 ± 1.0 (0-4)	.013
Final follow-up	0.3 ± 0.5 (0-1)	0.3 ± 0.5 (0-1)	.855
Range-of-motion deficit (degrees)			
Forward elevation	4 ± 6.1	2 ± 7.3	.125
External rotation at side	5 ± 7.7	3 ± 4.1	.392
External rotation at 90° of abduction	6 ± 3.4	3 ± 3.8	.254
Internal rotation behind back (vertebral level)	0.8 ± 1.9	0.6 ± 1.2	.673
Mean time for 90% of final external rotation†	8.9 ± 1.7 (6-12)	6.9 ± 1.7 (4-11)	<.001
Mean activity return (percent)	82 ± 13 (50-100)	83 ± 12 (50-100)	.799
Mean time for 90 percent activity return (wk)	12.4 ± 2.1 (9-16)	9.1 ± 2.5 (6-16)	<.001
Patients' satisfaction with the initial phase of rehabilitation			<.001
Satisfactory	2 (7%)	23 (68%)	
Good	8 (29%)	8 (24%)	
Unsatisfactory	18 (64%)	3 (9%)	

*The values are given as the number of patients unless otherwise indicated.
†The mean time for achieving 90% of the final level of external rotation with the arm at 90° of abduction.

patients in group 1 and 30 in group 2 showed excellent results. Three in each group had good, and one in each group had fair results.

Pain

At 6 weeks after surgery, patients who underwent the accelerated rehabilitation expressed significantly less pain than patients with conventional rehabilitation ($P = .013$) (Fig 3). The pain scores at the final follow-up evaluation showed no significant difference between the 2 groups ($P = .855$). Twenty patients in group 1 and 25 in group 2 did not have activity-related shoulder pain at the final follow-up evaluation. Eight patients from group 1 and 9 from group 2 revealed scale 1 shoulder pain.

Range of Motion

With the numbers available, no significant difference was seen in range of motion at the final follow-up evaluation between the 2 groups. However, patients with the accelerated rehabilitation were faster in resuming 90% of the final range of external rotation ($P < .001$).

Return to Activity

Patient activity increased significantly at the final follow-up in both groups ($P < .001$). No significant difference was seen in the status of activity return between the 2 groups at the final follow-up ($P = .799$). However, patients with accelerated rehabilitation were able to return faster to the previous activity. The time to resume 90% of the final level of activity was shorter in group 2 than in group 1 ($P < .001$).

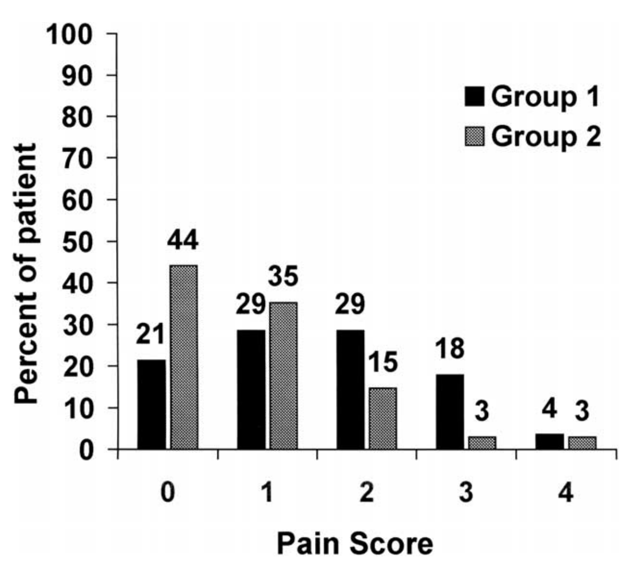

FIGURE 3. At 6 weeks after the surgery, patients in group 2 showed significantly less pain than patients in group 1 ($P = .013$).

Patient Satisfaction with Rehabilitation Program

Most of the patients in group 2 were satisfied with the early motion in the accelerated rehabilitation, and most patients in group 1 were dissatisfied with the brace immobilization during rehabilitation ($P < .001$).

Patient Adherence

Twenty-five patients in group 1 and 31 in group 2 completed required visits, rehabilitation, and evaluations after surgery. Two patients from group 1 had their braces removed 1 and 2 weeks after surgery. One patient did not complete the final 2 weeks of the rehabilitation regimen. In group 2, 2 patients did not complete the rehabilitation program, and another 2 delayed the sixth-week evaluation for 1 week.

Analysis of Unsatisfactory Results

Of the 4 patients with a positive anterior apprehension test result, 2 were involved in sports: tennis (group 1) and swimming (group 2). The other 2 patients were not involved in any type of sports. One patient from group 1 who was not involved in any sporting activities had 20% anterior glenoid defect and the other 3 had intact glenoid surface except a Bankart lesion. All had robust anterior labrum and none of the patients showed a glenohumeral laxity or patulous anterior capsule.

DISCUSSION

Arthroscopic Bankart repair has been generally believed to be less stable and require a longer period of immobilization. However, the present study showed that if surgeons select the appropriate patients, based on our selection criteria, the accelerated rehabilitation after arthroscopic Bankart repair can be safe for maintaining shoulder stability, can promote functional return, and can decrease morbidity.

The advantage of early mobilization either after surgery or in nonoperative treatment has been well documented in other joints, such as rehabilitation for medial collateral ligament injury or anterior cruciate ligament reconstruction in the knee joint, as well as Achilles tendon repair.[22-26] However, in the shoulder joint, from Hippocrates' historical cauterizing of axillary soft tissues with hot irons to modern types of surgical repair, immobilization was maintained in the hope of protecting shoulder stability by providing scar tissue augmentation.

In arthroscopic Bankart repair, the increased recurrence rate after transglenoid repair forced surgeons to rely on the extended immobilization, which has never been proved beneficial for shoulder stability, but lessened the potential advantage of arthroscopic surgery, an early initiation of the joint motion. Unlike open Bankart repair, the arthroscopic repair may cause minimal additional inflammatory response on the surrounding parts of the shoulder. Thus stability after arthroscopic repair may depend mainly on the healing of the repaired capsulolabral tissue. Therefore, prolonged immobilization beyond this healing time of the capsulolabral tissue may not have any further benefits for the stability. Furthermore, a more recent arthroscopic technique that uses suture anchors and nonabsorbable sutures allows multiple fixation sites in the anterior margin of the glenoid and provides a more secure initial fixation.[15,16] As such studies show, the results of the arthroscopic suture anchor technique were very successful in a highly demanding patient population.[15]

Our concept of early motion originated from young patients involved in our previous routine rehabilitation protocol. Some of these patients showed poor adherence in wearing a standard immobilization device at the early period of rehabilitation and still had a stable shoulder.

However, too-rapid return to normal activities could have contributed to instability recurrence with the Caspari technique.[8,27] Therefore, early motion in our study was maintained within a well-controlled limit. A major cause of lack of confidence in shoulder movement in the initial postoperative period is pain.[28] Early motion will assist in decreasing patient pain through neuromuscular modulation.[29,30] Significantly reduced postoperative pain in early mobilized patients in this study may facilitate postoperative rehabilitation. In addition, earlier return to functional activities may partly be caused by the absence of the immobilization effect on the shoulder muscle. Wickiewicz et al.[31] reported that most human shoulder musculature is roughly a 50:50 mixture of slow- and fast-twitch muscle fiber. Immobilization has been shown to have a greater effect on slow-twitch fibers. The advantages of the accelerated rehabilitation in this study were lesser postoperative pain, earlier gain of shoulder motion, earlier return to functional activity, and better patient satisfaction with postoperative care.

Recent experimental studies have provided basic knowledge on the safe margin of external rotation after the arthroscopic Bankart repair. In a cadaveric study, Itoi et al.[32] suggested that a significant amount of external rotation in various degrees of shoulder abduction could be safely applied to the shoulder without separating the simulated Bankart lesion. The coaptation zone, which is a range of external rotation that maintains the edges of the Bankart lesion apposed, was much larger than expected. With the arm in adduction, the edges of the simulated Bankart lesion were coapted throughout the full range of internal rotation to 30° of external rotation. With the arm at 30° of flexion or abduction, the coaptation zone ranged from full internal rotation to neutral rotation. We believe that the early motion after arthroscopic Bankart repair in our study was similar to the coaptation zone of the study of Itoi et al. We agree that the coaptation zone in an in vivo setting may be even larger than the zone defined in the cadaveric study, because the subscapularis and other soft tissues may prevent separation of the site of the lesion from the glenoid. As long as the arm is within the coaptation zone, shoulder motion that increases soft tissue tension may be preferable to the conventional immobilization of adduction and internal rotation, in which the anterior structures are lax.

In cadaveric measurement of external rotation in the late cocking phase of throwing motion, Kuhn et al.[33] reported that cutting the entire inferior glenohumeral ligament resulted in the largest gain in external rotation, whereas the anterior band of the inferior glenohumeral ligament and superior glenohumeral ligament were significantly less important in limiting external rotation. Because the position of the arm in the study by Kuhn et al.[33] was the late cocking position, which included more abduction than the range of motion in our rehabilitation, we can assume that the anterior band of the inferior glenohumeral ligament may be less important in limiting external rotation within the lesser degree of abduction in our range of motion. Therefore, early motion in the lesser degree of abduction may be safe for the repaired anterior band of the inferior glenohumeral ligament.

These 2 studies support that an early controlled motion, including external rotation after Bankart repair, may not stretch or detach the repaired anterior capsulolabral tissues. This was confirmed by the same recurrence rate found in both groups. Furthermore, the application of increased stress to the healing ligament resulted in improved biomechanical, biochemical, and morphologic properties over time.[4,10,20] Early motion after arthroscopic Bankart repair in this study may act as a positive stimulus to collagen maturation.

The strengths of this study include that it was a prospective randomized study with strict inclusion and exclusion criteria and no bias in selecting cases and controls. We instituted a power study while designing this study. Additionally, the number of patients in both groups were large enough to validate the difference in recurrence. To our knowledge, this is the first study that reports the effects of early motion after arthroscopic Bankart repair, showing it to be as safe as immobilization in conventional rehabilitation. The weakness of this study, however, is that it included only a very specific subset of instability patients with a small Bankart lesion without significant anterior bony defect. The other, larger percentage of patients with more serious lesions may not show the same results. No difference was noted in long-term results with either program. Therefore, the conclusions from this study cannot be extrapolated to all instability patients.

In conclusion, accelerated rehabilitation that incorporates an early controlled motion is safe in selected patients after arthroscopic Bankart repair using suture anchors. Early motion promotes shoulder function and decreases morbidity. We recommend the accelerated rehabilitation program to promote functional recovery without confining patients in unnecessary shoulder braces.

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