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The Influence of Diabetes Mellitus on Clinical and Structural Outcomes After Arthroscopic Rotator Cuff Repair

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Background: The clinical effect of sustained hyperglycemia on tendon-to-bone healing after rotator cuff repair has not been well characterized.

Purpose: To compare the clinical and structural outcomes between diabetic and nondiabetic patients after arthroscopic rotator cuff repair and to determine the effect of a diabetic phenotype on tendon-to-bone healing.

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

Methods: This study retrospectively evaluated a total of 335 shoulders that were available for magnetic resonance imaging (MRI) evaluation at least 6 months after arthroscopic rotator cuff repair using the suture-bridge technique with a minimum follow-up of 1 year. Only patients who had medium- to large-sized tears with supraspinatus of fatty infiltration <2 and no or mild atrophy were enrolled in this study. There were 271 nondiabetic patients (group A) and 64 diabetic patients (group B). The mean age at the time of operation for groups A and B was 57.7 and 58.2 years, respectively, and the mean duration of follow-up after surgery was 27.8 and 24.8 months, respectively.

Results: At the last follow-up, there were no statistically significant differences between the 2 groups with regard to pain at rest and during motion (P = .212 and .336, respectively). Both groups reported statistically significant improvement in Constant and Shoulder Rating Scale of the University of California at Los Angeles scores (P = .323 and .241, respectively), but there was no statistically significant difference between the 2 groups. In assessing the repair integrity with postoperative MRI scans, 39 of 271 cases in group A (14.4%) and 23 of 64 cases in group B (35.9%) had retears, and the difference between the 2 groups was statistically significant ($P < .001$). In analyzing the retear rates according to the severity of sustained hyperglycemia in group B, retear was found in 16 of 37 (43.2%) uncontrolled diabetic patients with poor glycemic control ($\geq$7.0% of preoperative serum glycosylated hemoglobin [HbA1c] levels) and in 7 of 27 (25.9%) controlled diabetic patients ($<$7.0%) ($P < .001$).

Conclusion: Pain, range of motion, and function all significantly improved after arthroscopic rotator cuff repair using the suture-bridge technique, regardless of the presence of diabetes. However, sustained hyperglycemia increased the possibility of anatomic failure at the repaired cuff. In diabetic patients, an effective glycemic control was associated with better rate of healing after rotator cuff repair.

Keywords: shoulder; rotator cuff tear; arthroscopic repair; diabetes mellitus; clinical outcome; structural outcome; tendon healing; retear

Diabetes mellitus remains one of the most common and debilitating medical conditions. Long-term effects of uncontrolled hyperglycemia include peripheral neuropathy, kidney and gastrointestinal dysfunction, immunodeficiency, retinopathy, and musculoskeletal and tissue-repair disorders.[18,29] Patients with diabetes mellitus may experience increased surgical risks, including a higher risk of infection, compromised tissue quality for repair, and a propensity for problems with wound healing.[6,14,18]

Until now, details about the relationship between diabetes and tendon healing still remain unclear. However, several reports and some epidemiological studies frequently emphasize the possible connection between diabetes mellitus and alterations of tendons in various parts of the body.[2,16,21] Also, poorly controlled diabetes negatively affected the mechanical properties of native tendon and healing of an injured tendon in an experimental rat model.[19]

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TABLE 1
Patient Demographics

Variable	Nondiabetic (Group A)	Diabetic (Group B)	*P* Value
No. of patients	271	64	
Sex, male/female, n	141/130	35/29	.770
Age, y, mean (range)	57.7 (42-74)	58.2 (51-75)	.265
Shoulder affected, n			
Right/left	187/84	41/23	.484
Dominant/nondominant	225/46	53/11	.387
Follow-up time, mo, mean (range)	27.8 (12-62)	24.8 (12-55)	.145
Time to postoperative MRI, mo, mean (range)	6.5 (6-12)	7.3 (6-12)	.872
Size of tear (medium/large), n	170/101	30/34	.217
Global fatty degeneration index[a]	1.35 (0-2)	1.53 (0-2)	.650
Muscle atrophy (normal/mild), n	194/77	44/20	.793

[a]For each shoulder, fatty degeneration was evaluated not only in each cuff muscle individually but in all cuff muscles combined by calculating the global fatty degeneration index as the mean value of the grading of muscle fatty degeneration (0 = no fatty deposits; 1 = some fatty streaks; 2 = more muscle than fat; 3 = as much muscle as fat; 4 = less muscle than fat) for the supraspinatus, infraspinatus, and subscapularis.

A previous study reported the outcome in patients with type 1 diabetes after mini-open repair of the rotator cuff and showed an increased rate of postoperative infection and failure of repair, with a decreased range of motion in diabetic relative to nondiabetic patients.[14] However, the effect of diabetes on the outcome after arthroscopic repair of the cuff and the effect of sustained hyperglycemia on tendon-to-bone healing have not been well characterized. To our knowledge, few previous studies have specifically examined the anatomic results of arthroscopic rotator cuff repair in the diabetic population.

The purpose of our study was to compare the clinical and structural outcomes between diabetic and nondiabetic patients after arthroscopic rotator cuff repair and to determine the effect of a diabetic phenotype on tendon-to-bone healing. We hypothesized that the risk of structural failure after arthroscopic rotator cuff repair in diabetic patients with poor glycemic control may be higher than in well-controlled or euglycemic patients. We also hypothesized that sustained hyperglycemia would be associated with inferior clinical outcomes compared with matched euglycemic controls.

METHODS

Final approval of exemption from review by the institutional review board was obtained for this study because it was retrospective in nature (KMC IRB 1407-06).

Patient Selection

From January 2006 to June 2012, a total of 921 consecutive shoulders received arthroscopic rotator cuff repair for the treatment of full-thickness rotator cuff tears. For precise comparative study under homogeneous conditions, we enrolled only patients who had medium- to large-sized tears with supraspinatus fatty infiltration <2 and no or mild atrophy that could be repaired without undue tension with the suture-bridge repair technique based on arthroscopic findings. Patients who had partial rotator cuff tear, acromioclavicular arthritis that required distal clavicle resection, advanced glenohumeral arthritis, rotator cuff tears with a workers' compensation claim, or who needed tenotomy or tenodesis of the long head of the biceps were excluded from the study. Patients undergoing revision procedures were also excluded.

A total of 335 shoulders that were available for magnetic resonance imaging (MRI) evaluation at least 6 months after arthroscopic rotator cuff repair using the suture-bridge technique with a minimum follow-up of 1 year were enrolled for this study. We compared the clinical and structural outcomes in 271 nondiabetic patients (group A) with those in 64 diabetic patients (group B). The extent of the tear was determined intraoperatively under direct arthroscopic visualization after debridement of the degenerated tendon edges. The tear size was measured in the anterior-posterior dimension using a calibrated probe introduced through the posterior portal while viewing from the lateral portal. According to the classification of DeOrio and Cofield,[17] tear size was categorized as small (<1 cm), medium (1-3 cm), large (3-5 cm), or massive (>5 cm). Preoperative fatty degeneration and the global fatty degeneration index (GFDI; the mean value of the 3 muscles—supraspinatus, subscapularis, and infraspinatus) was evaluated for each muscle with the 5-stage grading system developed by Goutallier et al.[20] Preoperative muscle atrophy was evaluated on the oblique sagittal plane image medial to the level of the coracoid process with the 4-stage grading system (normal, mild, moderate, or severe) developed by Warner et al.[33] There were no significant differences in the demographic data (Table 1).

Measurement of Glycosylated Hemoglobin

Serum glycosylated hemoglobin (HbA1c) levels were measured to confirm a diabetic or euglycemic phenotype and quantify the severity of sustained hyperglycemia.

Measurement of HbA1c is an established procedure for estimating the plasma glucose concentration present for the 120-day life span of the red blood cell.[5,13,21,24] The diagnostic cutoff point for diabetes is a fasting plasma glucose level of ≥126 mg per deciliter (≥7.0 mmol/L) or a glycated hemoglobin level of ≥6.5%; the diagnosis requires confirmation by this or another diagnostic tool.[4] In addition, to quantify the severity of sustained hyperglycemia in the diabetic patient group, those with ≥7.0% preoperative serum HbA1c levels were arbitrarily defined as uncontrolled diabetic patients with poor glycemic control, and those with <7.0% preoperative serum HbA1c levels were considered controlled diabetic patients.

Preoperative and Postoperative Evaluations

Preoperative and postoperative subjective pain score was measured with the visual analog scale (VAS). For shoulder range of motion (ROM), forward flexion, external rotation at the side, internal rotation to the back, cross-body adduction, and abduction were assessed before and after operation. For evaluation of postoperative stiffness, we defined shoulder stiffness for passive forward elevation as less than 120°, passive external rotation at the side as less than 30°, and passive internal rotation to the back as lower than the L3 level.[27] Quantitative muscle strength measurements of the rotator cuff were assessed with use of a portable, handheld Nottingham Mecmesin Myometer (Mecmesin Co). Elevation strength was tested with the patient in the seated position with the arm elevated to 90° in the scapular plane. External and internal rotation was tested with the shoulder in a neutral position (at the side) and the elbow in 90° of flexion. The Constant score[2] and the Shoulder Rating Scale of the University of California at Los Angeles (UCLA)[3] were used for clinical assessment.

Operative Techniques

All operations were performed by a single surgeon with the patient in a beach-chair position with the back of the bed flexed about 70°. Four portals were typically required for rotator cuff repair. After subacromial decompression was completed, the posterolateral portal was used as a viewing portal for the "Grand Canyon" view,[25] and the posterior and anterosuperior portals were used as the "waiting room" portal.[7] After adequate visualization, preparation, and release of the tendon, the upper surface of the greater tuberosity was abraded widely with a shaver, removing all soft tissue and cortical bone, to create a bleeding cancellous bone bed. A formal bone trough was not made.

For transosseous-equivalent (suture bridge) repairs, the suture anchor, a 5.5 mm Bio-Corkscrew FT (Arthrex) prethreaded with two No. 2 FiberWire sutures (Arthrex), was placed at the sulcus or articular margin. The suture was passed through the tendon as medially as possible, ideally 10 to 12 mm medial to the lateral edge of the torn tendon, to maximize the amount of lateral tendon available for compression. The remaining sutures were repeated to create a horizontal mattress configuration. A medial row was created with suture anchors that use mattress sutures. After the medial row was completed, the suture limbs were then used to create suture bridges over the tendon. The lateral fixation points were placed 1 cm distal-lateral to the lateral edge of the tuberosity footprint insertion. One FiberWire strand from each Bio-Corkscrew FT was retrieved and threaded through the Bio-PushLock (Arthrex) eyelet on the distal end of the driver. The distal tip of the Bio-PushLock was brought to the edge of the pilot hole to reduce the tendon to its desired position on the footprint while holding onto the suture tails. The driver was then advanced into the pilot hole completely, until the anchor body contacted bone. While keeping adequate tissue tension by pulling on each suture strand independently, the anchor body was tapped into the pilot hole. Finally, the sutures were cut flush. With use of the same steps, the other FiberWire strand from each Bio-Corkscrew FT was also fixed by the Bio-PushLock for the lateral row. The number of suture anchors (Bio-Corkscrew FT and Bio-PushLock) used depended on the size of the tear. The arm was immobilized in a sling after routine portal closure.

Postoperative Rehabilitation

All patients followed a standard postoperative rehabilitation program. From the day of operation, passive exercises, including pendulum exercises, passive forward flexion, and external rotation exercises, were performed. Active exercises were not allowed until 6 weeks postoperatively or until regaining full passive range of motion. Active-assisted exercises were started at 6 weeks postoperatively, and muscle strengthening exercises were introduced thereafter gradually. A return to recreational activity with heavy demands on the shoulder or to manual labor was delayed for 6 months.

Assessment of Tendon Healing

A postoperative MRI scan was performed at a mean of 7.2 months (range, 6-12 months) after surgery. All studies were obtained with a 1.5-T unit (Signa; GE Medical Systems) by use of the routine pulse sequences. The images were reviewed by 1 experienced senior radiologist who was informed that the patients had undergone surgery for rotator cuff repair and was blinded to the size and location of the tear that had been repaired. Continuity and rerupture of the tendon were assessed on MRIs according to established MRI criteria.[22,30] When a fluid equivalent signal or nonvisualization of the supraspinatus, infraspinatus, or subscapularis tendon was found on at least 1 T2-weighted or proton density-weighted image, the diagnosis of a full-thickness retear (ie, anatomic failure of healing) was made.

Statistical Analysis

An independent *t* test was used to compare pain, range of motion, muscle strength, and clinical score between the 2 groups. The Pearson chi-square test was also performed to compare the incidence of postoperative stiffness and retear between the 2 groups. Significance was set at an α level of 0.05 with associated 95% confidence intervals.

TABLE 2
Comparison of Preoperative Results in Nondiabetic and Diabetic Groups[a]

Variable	Nondiabetic (Group A)	Diabetic (Group B)	P Value
VAS pain			
At rest	1.65 ± 1.82	1.68 ± 2.30	0.726
During motion	5.01 ± 2.21	4.47 ± 2.20	0. 284
Range of motion			
Forward flexion, deg	162.3 ± 18.4	148.6 ± 27.0	0.043
ERs, deg	47.9 ± 19.9	38.0 ± 21.2	0.125
IRp, level, mean (range)	T11.3 (T5-L5)	T12.4 (T5-L5)	0.313
CBa, cm	22.6 ± 7.5	23.5 ± 5.2	0.139
Abduction, deg	165.5 ± 25.0	152.0 ± 27.2	0.238
Muscle strength, kg, mean			
Forward flexion	4.36 ± 1.85	3.30 ± 1.74	0.157
External rotation	6.23 ± 2.06	5.80 ± 1.95	0.393
Internal rotation	8.23 ± 2.57	6.89 ± 2.26	0.250
Constant score	64.35 ± 7.47	61.59 ± 15.36	0.768
UCLA score	16.59 ± 6.50	15.76 ± 4.01	0.280

[a]Values are reported as mean ± SD unless otherwise indicated. Abd, abduction; CBa, cross-body adduction; ERs, external rotation at the side; FF, forward flexion; IRp, internal rotation to the posterior; UCLA, Shoulder Rating Scale of the University of California at Los Angeles; VAS, visual analog scale.

The SPSS software package (v 18.0; SPSS Inc) was used for all statistical analyses.

RESULTS

Pain

At the last follow-up, both groups reported statistically significant improvement in subjective pain score (VAS) at rest and during motion, but the 2 groups did not show statistically significant differences in VAS at rest and during motion (P = .212 and .336, respectively) (Tables 2 and 3).

Range of Motion

Preoperatively, there was a significant difference only in forward flexion between the 2 groups. In group A, the mean active range of motion for forward flexion changed from 162.3° ± 18.4° preoperatively to 167.4° ± 6.9° at the last follow-up; external rotation at the side, from 47.9° ± 19.9° to 52.3° ± 14.4°; and internal rotation to the back, from T11.3 (range, T5-L5) to T10.7 (range, T3-L2) (P = .057, .084, and .831, respectively). In group B, the mean preoperative range of motion for forward flexion, external rotation at the side, and internal rotation to the back were, respectively, measured at 148.6° ± 27.0°, 38.0° ± 21.2°, and T12.4 (range, T5-L5). At the last follow-up, the results were 162.3° ± 2.9°, 47.7° ± 13.5°, and T11.9 (range, T3-L4), respectively (P = .002, .041, and .625, respectively). Compared with preoperative measurements, group B had statistically significant improvement in forward flexion and external rotation at the side at the last follow-up, but there was no statistically significant difference between the 2 groups (P = .085, .068, and .477, respectively) (Tables 2 and 3).

Muscle Strength

Both groups reported statistically significant improvement in muscle strength at the last follow-up, but there was no statistical difference between the 2 groups (P = .087, .746, and .650, respectively) (Tables 2 and 3).

Clinical Assessment

The Constant score in group A increased from the preoperative mean of 64.35 ± 7.47 to 85.17 ± 5.37 at the last follow-up (P < .001). The corresponding figures for group B improved from 61.59 ± 15.36 to 81.76 ± 7.37 (P < .001). The preoperative UCLA score was 16.59 ± 6.50 in group A and 15.76 ± 4.01 in group B. The UCLA score at the last follow-up was 33.24 ± 2.18 in group A and 31.05 ± 3.60 in group B (P < .001 for both). In group A, there were 117 excellent (43.2%), 136 good (50.2%), and 18 poor (6.6%) cases. Group B had 10 excellent (15.6%), 46 good (71.9%), and 8 poor (12.5%) cases. Both groups reported statistically significant improvement in clinical assessments, and the difference between the 2 groups was not significant (P = .323 and .241, respectively) (Tables 2 and 3).

Postoperative Stiffness

The incidence of postoperative stiffness (passive forward elevation <120°, passive external rotation at the side <30°, and passive internal rotation to the back <L3 level) in group A was 9.6% (26/271 shoulders) at 3 months postoperatively and 5.5% (15/271 shoulders) at the last follow-up; in group B the incidences were 14.1% (9/64 shoulders) and 9.4% (6/64 shoulders), respectively. At the last follow-up, there was no statistically significant difference between the 2 groups (P = .254)

TABLE 3
Comparison of Postoperative Results in Nondiabetic and Diabetic Groups[a]

Variable	Nondiabetic (Group A)	Diabetic (Group B)	*P* Value
VAS pain			
At rest	0.19 ± 0.29	0.34 ± 0.58	.212
During motion	0.98 ± 1.02	1.71 ± 1.53	.336
Range of motion			
Forward flexion, deg	167.4 ± 6.9	162.3 ± 2.9	.085
ERs, deg	52.3 ± 14.4	47.7 ± 13.5	.068
IRp, level, mean (range)	T10.7 (T3-L2)	T11.9 (T3-L4)	.477
CBa, cm	17.0 ± 5.8	19.0 ± 6.6	.598
Abduction, deg	170.2 ± 11.5	167.5 ± 8.0	.237
Muscle strength, kg, mean			
Forward flexion	7.86 ± 2.63	6.67 ± 1.93	.087
External rotation	7.98 ± 2.55	7.18 ± 1.55	.746
Internal rotation	9.49 ± 2.96	8.55 ± 2.23	.650
Constant score	85.17 ± 5.37	81.76 ± 7.37	.323
UCLA score	33.24 ± 2.18	31.05 ± 3.60	.241

[a]Values are reported as mean ± SD unless otherwise indicated. Abd, abduction; CBa, cross-body adduction; ERs, external rotation at the side; FF, forward flexion; IRp, internal rotation to the posterior; UCLA, Shoulder Rating Scale of the University of California at Los Angeles; VAS, visual analog scale.

TABLE 4
Comparison of Structural Outcomes in Nondiabetic and Diabetic Groups[a]

		Diabetic (Group B)[b]		
Variable	Nondiabetic (Group A)	Controlled	Uncontrolled	Total
Complete healing	232 (85.6)	20 (74.1)	21 (56.8)	41 (64.1)
Retear[c,d]	39 (14.4)	7 (25.9)	16 (43.2)	23 (35.9)

[a]Values are reported as n (%).
[b]Controlled, <7.0% of preoperative serum glycosylated hemoglobin (HbA1c) levels; uncontrolled, ≥7.0% of preoperative serum HbA1c levels.
[c]Statistically significant between the nondiabetic and diabetic groups ($P < .001$).
[d]Statistically significant between controlled diabetic patients and uncontrolled diabetic patients with poor glycemic control in the diabetic group ($P < .001$).

Structural Outcome

In assessing the repair integrity of both groups with postoperative MRI scans, we found complete healing in 232 (85.6%) of the total 271 shoulders in group A, and retear was observed in 39 shoulders (14.4%). In group B, complete healing was found in 41 (64.1%) of the total 64 shoulders, and retear was observed in 23 shoulders (35.9%). The retear rate in group B was higher than that in group A (14.4% vs 35.9%; $P < .001$).

In analyzing the retear rates according to the severity of sustained hyperglycemia in the diabetic group, retear was found in 16 (43.2%) of 37 uncontrolled diabetic patients with poor glycemic control (≥7.0% of preoperative serum HbA1c levels) and in 7 (25.9%) of 27 controlled diabetic patients (<7.0% of preoperative serum HbA1c levels). The retear rate in controlled diabetic patients was significantly lower than that in uncontrolled diabetic patients with poor glycemic control ($P < .001$) (Table 4).

DISCUSSION

Many factors are involved in the successful healing or structural failure of the repaired tendon.[1,8,9,26] However, some of these factors that affect healing of the rotator cuff are beyond the surgeon's control. The uncontrollable factors associated with rotator cuff healing are preoperative patients' conditions, including severe muscle fatty degeneration and atrophy, larger tear size, poor tendon quality, repetitive trauma from impingement, and diabetes.

Diabetes mellitus is a complex disorder characterized by persistent hyperglycemia. Diabetes mellitus has been recognized to cause a wide range of musculoskeletal disorders, including tenosynovitis and joint stiffness. Also, tendon structure and healing after injury are affected by diabetes.[2,3,24] Batista et al[5] found that 89% of diabetic patients had disorganized tendon fibers and 76% had calcification within the Achilles tendon. Grant et al[21] reported the consistent clinical observation of extreme shortening of the Achilles tendon gastrocnemius-soleus complex with advanced diabetes. Others have similarly reported structural changes in diabetic tendon, with 1 study showing diabetic tendon preparations to be 13% shorter than controls in a canine model.[24] Regarding tendon healing, Chbinou and Frenette[13] investigated the tendon healing process by using a diabetic rat tendinitis model and reported that alterations in inflammatory, angiogenic, and proliferative processes occurred in the diabetic state that might eventually perturb tendon healing and remodeling. Using a rat model of rotator cuff repair, Bedi et al[6] found that sustained hyperglycemia was associated with a clear impairment of healing at the enthesis, manifested by inferior histological characteristics and decreased load to failure and stiffness of the repair construct compared with euglycemic animals.

Questions concerning diabetic patients after rotator cuff repair may include whether they have inferior clinical outcomes, more frequent postoperative stiffness, a higher retear rate, and increased risk of postoperative infection or not. Such information has significant clinical implications for the expected outcomes of rotator cuff repair in diabetic patients with poor glycemic control. In our study, the retear rate in diabetic patients was significantly higher than that in nondiabetic patients (35.9% vs 14.4%). According to the severity of sustained hyperglycemia in the diabetic group, the retear rate in controlled diabetic patients was significantly lower than that in uncontrolled diabetic patients with poor glycemic control (25.9% vs 43.2%). Based on this current study, the risk of structural failure after rotator cuff repair in diabetic patients with poor glycemic control may be higher than that in euglycemic patients.

One study noted that shoulder pain was present in 25.7% of diabetic patients compared with 5.0% of general medical patients, with a higher incidence of shoulder stiffness in diabetic patients.[32] Another study also revealed a developing shoulder stiffness in up to 36% of insulin-dependent diabetic patients compared with 3% of the general population.[11] A number of observational studies have indicated that diabetes is associated with joint stiffness.[4,10,12] The stiffness can arise from a capsular contracture. Bridgman[10] investigated the prevalence of frozen shoulder in 800 diabetic and 600 nondiabetic patients. This study reported frozen shoulder occurs in 10.8% of diabetic patients and in 2.3% of nondiabetic patients. Thomas et al[32] found that a longer duration of diabetes correlated with an increased prevalence of frozen shoulder.

Although there is still a debate, several factors, such as diabetes mellitus and postsurgical adhesion to the surrounding soft tissues, have been suggested as causes of postoperative stiffness specifically related to rotator cuff repair surgery.[8,28,31,32] Chen et al[14] reported that significant differences in shoulder active and passive range of motion were found postoperatively at 6 weeks, 6 months, and final follow-up after rotator cuff repair. However, they concluded that repair of the diabetic rotator cuff may be performed with the expectation of improved motion and function, although less than nondiabetic counterparts. Huberty et al[23] reported a 4.9% (24/489) incidence of shoulder stiffness after arthroscopic repair of the rotator cuff. Chung et al[15] also determined the incidence of postoperative stiffness after rotator cuff repair and evaluated postoperative stiffness with respect to its risk factors and its influence on outcome. They indicated that diabetes was not related to postoperative shoulder stiffness. In our study, postoperative stiffness was found in 9.6% at 3 months postoperatively and 5.5% at the last follow-up in the nondiabetic group and 14.1% and 9.4% in the diabetic group, respectively. The incidence of postoperative stiffness in the nondiabetic group was lower than that of the diabetic group, but there was no statistically significant difference between the 2 groups at the last follow-up. These incidences were similar to the results of other studies, even though some differences existed because of a wide variety of definitions of stiffness.[27,31]

Our study has a few limitations. First, being retrospective in nature, our study has limitations similar to other retrospective studies. But we conducted a retrospective analysis of the prospectively collected patient data. Second, the definition of uncontrolled diabetic patients with poor glycemic control ($\geq$7.0% of preoperative serum HbA1c levels) was somewhat arbitrary. However, the criteria to quantify the severity of sustained hyperglycemia in diabetic patients remain ambiguous even after consulting with endocrinological specialists.

In conclusion, pain, range of motion, and function all significantly improved after arthroscopic rotator cuff repair using the suture-bridge technique, regardless of the presence of diabetes. However, sustained hyperglycemia increased the possibility of anatomic failure at the repaired cuff. In diabetic patients, an effective glycemic control was associated with a better rate of healing after rotator cuff repair.

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