Elevated HgA1c is Not Associated with Reoperation following Arthroscopic Rotator Cuff Repair in Patients with Diabetes Mellitus

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INTRODUCTION: Hyperglycemia is a known risk factor for tendon degeneration due to oxidative stresses from production of advanced glycosylation end products. Consequently, diabetes mellitus (DM) predisposes patients to be at higher probability of undergoing rotator cuff repair surgery. In one study, DM patients experienced restricted shoulder motion, worse clinical outcomes, and diminished mental and physical health status following arthroscopic rotator cuff tear when compared to non-diabetic patients. Analysis of glycated hemoglobin (HgA1c) provides a 3 month window into a patient's glucose control, but no guidelines currently exist for ideal pre-operative HgA1c and glucose control prior to arthroscopic rotator cuff repair in patients with DM. This study aimed to evaluate if a critical HgA1c level is associated with surgical failure requiring reoperation following arthroscopic rotator cuff repair.

METHODS: We retrospectively evaluated all patients with DM who underwent primary arthroscopic rotator cuff repair from January 2014 to December 2018 at a single institution and had a preoperative Hg1Ac available within 3 months of surgery. Patient characteristics including age, gender, BMI, Charleston Comorbidity Index (CCI), American Society of Anesthesiologists Classification (ASA), Smoking status, and diabetes type. Medical records were queried to evaluate if a reoperation was performed as well as the subsequent procedure performed. Univariate statistical analysis was performed to assess factors associated with reoperation ($p < 0.05$ considered significant). Threshold, area under the curve (AUC), analysis was performed to assess if a critical HgA1c value was associated with reoperation.

RESULTS: Four hundred and two patients met inclusion criteria. Patients had an average age of 65.5 years (range 40-89) at time of surgery; 244 (60.6%) patients were male; and average BMI was 32.96 +/- 5.81. There were 27 (6.7%) Type 1 DM patients and 375 (93.3%) Type II DM patients in the cohort. Mean HgA1c was 7.36 (Range 5.2 to 12). Thirty three patients (8.2%) underwent subsequent reoperation. Six patients (1.5%) underwent capsular release and lysis of adhesions, 20 (5.0%) patients underwent a revision rotator cuff surgery, combination revision rotator cuff repair and lysis of adhesions, graft augmented revision repair, or superior capsular reconstruction, and 7 (1.7%) patients underwent revision to reverse shoulder arthroplasty (1.7%). Five patients underwent multiple subsequent revision surgeries (1.2%) [**Table 1**]. There were no cases of infection. There was no difference in preoperative HgA1c in the reoperation versus no reoperation groups (7.52 vs 7.36) (p= 0.54). When stratified into low (<6.5), medium (6.5 to 9), and high (greater than 9) thresholds, there was no HgA1c cutoff associated with increased reoperation risk. Furthermore, on AUC analysis, no critical HgA1c value was identified to predispose to reoperation. Interestingly, elevated preoperative ASA (2.8 vs 2.28, p = 0.001) was associated with a higher reoperation rate.

DISCUSSION AND CONCLUSION: In patients with DM, preoperative HgA1c is not a predictive factor for surgical failure requiring reoperation. Stable glycemic control and a lower HgA1c is important to a patient's overall health and may play a role in minimizing medical complications following rotator cuff surgery, but an elevated preoperative HgA1c should not be a strict surgical contraindication for arthroscopic rotator cuff repair. In patients with DM, an elevated ASA level is associated with an increased rate of surgical failure and subsequent reoperation rate and diabetic patients should be counseled   accordingly.

Table 1. Comparison of patients who did and did not undergo reoperation with patient characteristic risk factor analysis. Univariate analysis was utilized (p< 0.05 considered significant).

	No Reoperation (N=369)	Reoperation (N= 33)	p-value
Age (SD)	65.7 (7.59)	63.6 (6.80)	0.10
Sex			
Female (%)	149 (40.4%)	9 (27.3%)	0.19
Male (%)	220 (59.6%)	24 (72.7%)	
BMI (SD)	33.0 (5.88)	33.8 (5.28)	0.41
Charleston Comorbidity Index (SD)	3.45 (1.61)	3.42 (1.85)	0.94
ASA Level (SD)	2.28 (0.90)	2.80 (0.41)	**0.001**
Diabetes Type			
Type 1 (%)	23 (6.23%)	4 (12.1%)	0.26
Type II (%)	346 (93.8%)	29 (87.9%)	
HgA1c (SD)	7.36 (1.31)	7.52 (1.48)	0.54
HgA1c stratified			
HgA1c < 6.5 (%)	39 (10.6%)	5 (15.2%)	0.68
HgA1c 6.5 - 9 (%)	104 (28.2%)	9 (27.3%)	
HgA1c > 9 (%)	226 (61.2%)	19 (57.6%)	
Smoking Status			
Never (%)	211 (57.2%)	25 (75.8%)	**0.04**
Former (%)	88 (23.8%)	7 (21.2%)	
Current (%)	70 (19.0%)	1 (3.03%)	