Histological Fatty Accumulation, Myofiber Size, and Fibrosis were not associated with Re-Tear or Revision after Primary Rotator Cuff Repair at Minimum 1-Year Follow-Up

Lindsey Ruderman, Juliana M Ibarra, Helen E Rueckert, Abigail Leinroth, Chad Cook, Christopher Klifto, Matthew J. Hilton, Oke A Anakwenze

INTRODUCTION:
The failure rate following primary arthroscopic rotator cuff repair is high. While there is literature that suggests an association between greater fatty changes of the rotator cuff muscles based on magnetic resonance imaging (MRI) and higher failure rates, there are no existing studies reporting on failure rates in the context of the histological degree of fatty accumulation, histological fibrosis, and myofiber size of the rotator cuff muscle.
The objective of this study was to examine the association between histological fatty accumulation, fibrosis, and myofiber sizes of the rotator cuff muscles and re-tear and revision rates in patients who underwent primary arthroscopic rotator cuff repair at a minimum of 1-year follow-up.
METHODS:
This is a prospective study regarding a series of patients who underwent primary arthroscopic rotator cuff repair by a single surgeon at an academic tertiary institution between September 2020 and November 2023. All patients were indicated for rotator cuff repair with diagnosis of supraspinatus tear and had no history of prior rotator cuff surgery. Pre-operatively, rotator cuff tear size and rotator cuff muscle fatty degeneration using the Goutallier classification were graded on MRI. Supraspinatus muscle biopsies were obtained at the time of surgery, after the repair was completed. Biopsy specimens were cross-sectioned and stained with LipidTOX and LAMININ to visualize lipid accumulation and quantify myofiber cross-sectional area (CSA) at a histological level, respectively. FIBRONECTIN staining was performed to quantify histological fibrosis.
Medical records were reviewed for rotator cuff re-tear, re-operation, and revision surgery. Patients were included if they had minimum follow-up of at least 1 year either by phone call or by chart review of orthopedic provider notes. All statistical analyses were performed with Prism (GraphPad). All data was nonparametric; thus, Mann-Whitney U tests were performed. Fisher's exact tests were used for categorical variables. An alpha value of 0.05 indicated significance.
RESULTS:
A total of 53 patients (53 shoulders) underwent primary arthroscopic rotator cuff repair and met inclusion criteria. In February 2025, 5 patients had undergone revision while 48 patients were revision-free with minimum follow-up of at least 1 year. Mean follow-up time was 38.8 months (range 12-52 months) for non-revised patients.
Three non-revised patients experienced re-tear of the rotator cuff confirmed by MRI imaging. For the five revised patients, mean time to revision was 21.8 months (range 8-43 months). Revision surgeries included revision rotator cuff repair (3) and reverse total shoulder arthroplasty (2). Reasons for revision included rotator cuff re-tear in 4 patients and glenohumeral arthritis in 1 patient.
Between the 46 patients without re-tear and the 7 patients with re-tear, there were no significant differences in demographics including age, BMI, or sex. There were no significant differences between Goutallier grades or tear sizes between patients with re-tear and those without. There were no differences in LipidTOX/ROI, average myofiber CSA, and % area FIBRONECTIN between patients with re-tear and those without. Similarly, no significant differences were observed for patients who underwent revision surgery and those without revision for any of the aforementioned variables.
DISCUSSION AND CONCLUSION: This may be the first study to report on the association between failure rates and histological fatty accumulation, fibrosis, and myofiber sizes of the rotator cuff muscles in patients who underwent primary arthroscopic rotator cuff repair at a minimum of 1-year follow-up. There were no histological, demographic, or preoperative factors that were observed to be associated with increased re-tear or revision rates in this cohort.