



MICRO-FRAGMENTED ADIPOSE TISSUE IN THE SUCCESSFUL TREATMENT OF RECURRENT ROTATOR CUFF TEARS IN AN INJURED WORKER

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Abstract

This is the case of a 42-year-old right-handed male truck cargo mechanic who suffered a rotator cuff (RTC) tear of his right shoulder after a slip and fall while at work. An MRI of the shoulder demonstrated supraspinatus and infraspinatus tendon tears. After a trial of 4 months of nonoperative treatment, he underwent arthroscopic repair of his RTC. Postoperatively, he completed a course of physical therapy (PT) and a work conditioning program. Unfortunately, he had ongoing pain, limitations in range of motion (ROM), and functional limitations, which prevented him from returning to work. A repeat MRI demonstrated a retear of supraspinatus and infraspinatus tendons. After consulting with the author, he underwent a micro-fragmented adipose tissue injection under ultrasound guidance into the involved tendons. After 4 weeks of additional PT, he was noted to have full, pain-free ROM with normal strength and was able to return to his full work duties, including overhead lifting without restrictions.

Keywords: *musculoskeletal conditions; occupational/industrial injuries; pain; micro-fragmented adipose tissue; rotator cuff tear*

BACKGROUND

Shoulder pain constitutes a significant portion of outpatient musculoskeletal complaints each year.¹ Rotator cuff (RTC) pathology accounts for the majority of these shoulder cases.^{2,3} RTC pathology is also quite common in workers, especially in manual laborers. A systematic review noted that the treatment of workers' compensation patients with shoulder pathology had outcomes of lower magnitude for both operative and nonoperative intervention when compared to their nonworkers' compensation counterparts.⁴ Although there is a perception that RTC

tears require an operative treatment for successful patient outcomes, recent research has indicated that the natural history of these tears demonstrate no significant difference of operative versus nonoperative management.⁵

After undergoing RTC repair surgery, the risk for retear is high.⁶ Retear rates are as high as 16% at 6 months and 21% at 2 years following a primary-arthroscopic RTC repair. Following revision RTC surgery, the rate of retear is two times this rate.⁷ The lack of powerful data for treating RTC retears surgically makes it challenging to construct a clear algorithm.⁸ The role of alternative treatment options such

as autologous adipose tissue injections for treating RTC tears has been shown to be safe and beneficial in both animal models and human studies.^{9,10} This case reviews the management of a male worker who suffered a recurrent RTC tear treated with micro-fragmented adipose tissue (MFAT) injection.

CASE PRESENTATION

The patient is a 42-year-old right-handed male, referred by his workers' compensation carrier, who fell on an outstretched right arm and developed pain and weakness. An MRI of his right shoulder demonstrated subscapularis tendinosis and supraspinatus and infraspinatus tendon tears with associated muscle atrophy. Following the injury, he underwent a 4-month course of physical therapy (PT) without improvement and ultimately required surgical repair of his RTC with sutures. He completed several months of outpatient PT, including job-specific training with ongoing pain, diminished range of motion (ROM), and weakness. He was offered an amniotic tissue injection by the orthopedic surgeon. He was then referred for a second opinion by his worker's compensation carrier regarding treatment recommendations by the senior author.

At the time of his initial evaluation (12 months following his surgery), the patient reported sharp right anterior shoulder pain rated as a 5/10. Overhead activities and sleeping on his right side increased his pain. He noted weakness when reaching overhead and was unable to perform his prior job function as he was unable to lift objects above his head.

Examination of his right shoulder revealed no deformities or tenderness. Active ROM for forward flexion was 130, Abduction 110, and ER/IR (external rotation, internal rotation): 60/10. His strength was 5/5: biceps, triceps, IR, ER, and 4/5 strength in isolated supraspinatus testing. Yocum's and Empty can tests were positive. Neer's and Hawkin's tests were negative.

Ultrasound (US) (Figure 1) examination revealed subacromial bursa thickening with minimal fluid. Several suture anchors were visualized with surrounding cortical irregularity. There was a hypoechoic defect of a supraspinatus tendon consistent with a tear and tendinosis of the infraspinatus.

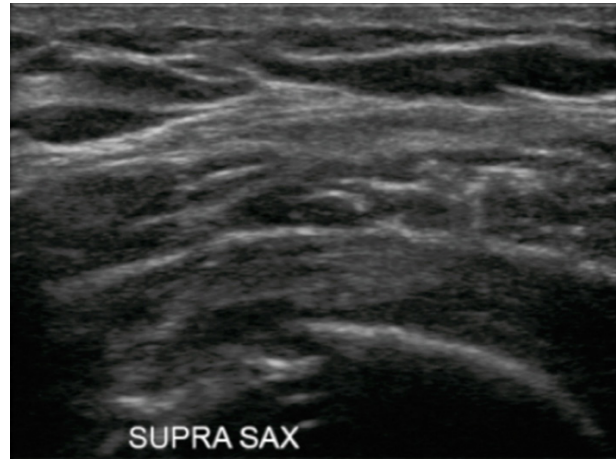


Figure 1. Short axis ultrasound image using a high frequency linear transducer demonstrating supraspinatus tear following a rotator cuff repair.

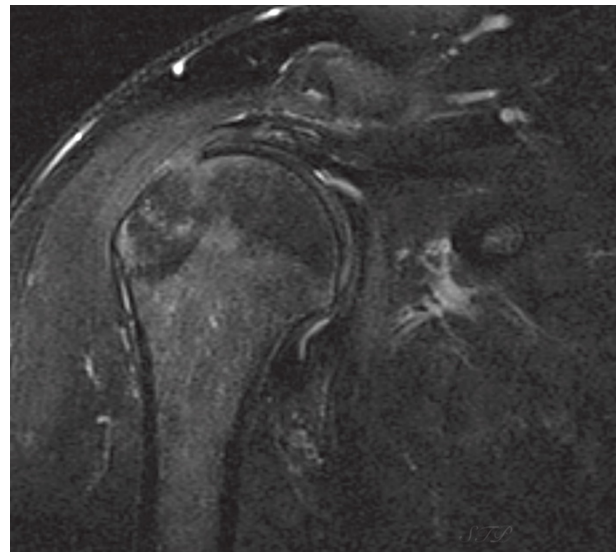


Figure 2. T2 weighted FS-magnetic resonance imaging of the right shoulder demonstrating a tear of the supraspinatus following a rotator cuff tear.

A repeat MRI of the right shoulder (Figure 2) 12 months post-surgery revealed a full-thickness complete tear of the supraspinatus with retraction to the 12-o'clock position with grade-1 atrophy, and interstitial tear of the infraspinatus.

TREATMENT

Given the patient's pain, limited ROM, and thickened subacromial bursa, an US-guided injection

into his bursa was recommended and performed using a combination of 1 mL of dexamethasone (40 mg/mL), 3 mL of 1% lidocaine, and 3 mL of normal saline. Immediately following this injection, he noted a significant decrease in pain and an increase in ROM of his right shoulder. He was referred for 4-weeks of additional outpatient PT to work on maximizing his ROM and RTC strength. On follow-up evaluation 6 weeks later, he had minimal pain and near full ROM but continued to have weakness with overhead activities that prevented him from being able to perform his work duties. Manual muscle testing demonstrated 4-/5 strength on isolated testing of the supraspinatus. The potential of using MFAT as a tissue filler and to assist with tissue healing was discussed with the patient and his case manager and agreed to proceed.

Adipose tissue was harvested from the patient's lower abdomen and processed using a Lipogems® device to create MFAT. Under US-guidance, MFAT was injected into the infraspinatus (2 mL), into the supraspinatus defect (6 mL), and into the subacromial bursa (2 mL). The patient tolerated the procedure well without complications. He was instructed to avoid non-steroidal anti-inflammatories (NSAIDs) for a few weeks and avoid heavy lifting or excessive shoulder use for 6 weeks. He then restarted PT at the same facility.

On a 2-month follow-up evaluation, he noted full pain relief and denied any right shoulder weakness. His ROM had increased to 170 degrees of forward flexion, 180 degrees of abduction, and ER/IR was 85/60 degrees, which was symmetric to the opposite side. Strength testing was normal for all RTC muscles. Empty can and impingement tests were negative. He was released to his prior work duties without restrictions.

At 2-year follow-up, the patient reported feeling "90–95% better." He reported that he still had difficulty with lifting heavy objects overhead, but he was able to manage it at work. The patient gained active abduction to 180 degrees without pain. Abduction strength also significantly improved, although not quite to the same strength of the contralateral side. Musculoskeletal US on this follow-up demonstrated tendinopathic changes of the supraspinatus and

infraspinatus, with partial thickness articular sided tearing of the supraspinatus, and some subacromial bursal thickening.

DISCUSSION

This case involves the difficult scenario of an injured worker who suffered a significant RTC tear following a repair. At the time of his consultation, 1 year from the time of his surgery, the treatment options were limited and the likelihood of returning to his prior work of heavy overhead manual labor was nearly zero percent. Salvage surgical procedures can be attempted; however, the outcomes following these treatments are quite variable and are not well supported, especially in workers' compensation patients.⁸ In this case, MFAT was used for its potential as a soft tissue filler/scaffold and its potential to facilitate reduction in pain and tissue healing.

Autologous MFAT can act as a tissue scaffold and provide structural support to the injured RTC tendons and facilitate tissue healing. The benefit of MFAT in part is due to its anti-inflammatory and paracrine mechanisms.¹¹ Striano et al. published a case series on a group of patients with severe shoulder pain with various pathologies including RTC tears. They found significant improvements in pain, function, and quality of life, as represented by positive outcomes in all measured scores through 12 months.¹²

CONCLUSIONS

This is a case of an injured worker who previously treated using RTC repair suffering a re-tear. Injured workers suffering from RTC tears required to perform heavy overhead activities have limited capabilities of returning to their same work even following surgical treatment. Re-tear of the RTC following surgical treatment is not uncommon and is much more difficult to treat. In this case, 1 year following RTC repair surgery, there was a low likelihood of this patient returning to his previous level of strenuous work. In this case, US-guided MFAT injection into the torn RTC tendons resulted in the patient regaining full strength, ROM, and return of essentially normal function including heavy

overhead work duties. Despite being out of work for nearly 2 years, he was able to return to full duty without restrictions 2 months following this procedure. Given the variability in patient outcome following RTC surgery, an US-guided MFAT procedure may be a potential treatment option when treating initial and recurrent RTC tears.

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