




CASE REPORT

Isolated infraspinatus musculotendinous junction tear treated with open repair and dermal allograft augmentation: a case report with 5-year outcome

Matthew G. Alben , Neil Gambhir  and Mandeep S. Virk *

Division of Shoulder and Elbow Surgery, Department of Orthopedic Surgery, NYU Grossman School of Medicine, NYU Langone Orthopedic Hospital, NYU Langone Health, New York, NY, USA

*Correspondence address. NYU Langone Orthopedic Hospital, 246 East 20th Street, New York, NY 10003, USA.
Tel: +1-646-356-9408; Email: mandeep.virk@nyulangone.org

Abstract

We report the 5-year outcome of an isolated, atraumatic full-thickness infraspinatus myotendinous junction tear treated with open surgical repair. The index patient developed severe pain and weakness in external rotation strength following a subacromial corticosteroid injection. Magnetic resonance imaging and ultrasound of the shoulder demonstrated a full-thickness myotendinous junction tear with extensive muscle edema, mild atrophy and a spinoglenoid notch varix. Due to persistent, worsening pain and presence of ER weakness, the patient underwent primary infraspinatus muscle–tendon repair with allograft augmentation via an arthroscopic-assisted open posterior approach. The patient had an uneventful postoperative course with a resolution of pain and improvement in ER strength, which is maintained at the latest 5-year follow-up. This case report highlights a favorable long-term outcome of an isolated infraspinatus myotendinous junction tear treated with primary muscle–tendon repair and dermal allograft augmentation.

INTRODUCTION

Although rotator cuff tears (RCTs) are among the most common sources of shoulder pain, isolated infraspinatus (IS) tears are relatively uncommon [1, 2]. Such tears are typically atraumatic in etiology and have peculiar imaging findings of muscle edema, often in conjunction with considerable fatty infiltration [1, 3]. Moreover, RCTs at the myotendinous junction (MTJ) are an atypical variant that continues to be a challenge when treating.

Herein, we describe the 5-year postoperative outcome of an isolated MTJ tear of the IS following arthroscopic-assisted open muscle–tendon repair with allograft augmentation via a posterior open approach. The patient reported resolution of her shoulder pain symptoms with external rotation (ER) strength recovery that has persisted as of her latest 5-year follow-up visit. The patient provided consent for data concerning the case to be submitted for publication.

CASE REPORT

History and preoperative findings

The index patient is a 52-year-old, right-hand dominant female with a history of right shoulder pain for 1 year.

Initial physical examination was remarkable for full range of motion (ROM) and 5/5 rotator cuff strength. She was initially treated with physical therapy and a subacromial steroid injection, returning for a second steroid injection for pain recurrence 5 months later. After the second injection, she reported an acute exacerbation of shoulder pain originally treated as a steroid flare reaction. However, further imaging was obtained due to persistent shoulder pain and noted weakness in her arm. MRI and ultrasound sonography demonstrated a complete tear of IS MTJ with a fluid-filled gap, edema and mild muscle atrophy (Fig. 1A and B), in addition to a venous varix in the spinoglenoid (SG) notch (Fig. 1C). Given the unremitting pain and shoulder weakness despite conservative therapy, the patient elected for surgical repair 5 months after acute worsening of symptoms (Fig. 2A).

Surgical treatment and postoperative care

Diagnostic arthroscopy demonstrated a retracted IS tear at the MTJ region (Fig. 3A). The tear site was tagged with a suture arthroscopically for the ease of identification via a posterior open approach (Fig. 3B). After

Received: April 19, 2022. Accepted: May 22, 2022

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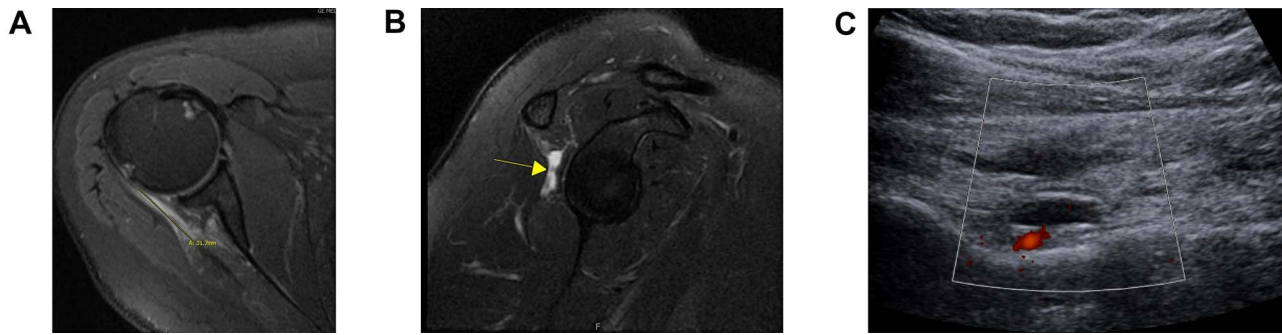


Figure 1. Axial (A) and sagittal (B) views of the preoperative MRI demonstrating a full-thickness tear at the level of the myotendinous junction with a fluid-filled gap (yellow arrow) and distal infraspinatus tendon stump attachment on the greater tuberosity. Ultrasound demonstrating a large, well-circumscribed hypoechoic lesion ultimately diagnosed as a venous varix adjacent to the suprascapular artery (C).



Figure 2. Preoperative (A) and postoperative (B) clinical photograph of the patient's posterior right shoulder at the 5-year follow-up visit.

arthroscopy, a 6-cm skin incision starting from the posterolateral corner of the acromion towards the axilla was made. Deltoid split was performed along the posterior raphe to expose the underlying IS muscle and tendon. The MTJ tear was easily identified by the marking sutures placed arthroscopically. High strength, nonresorbable sutures (#2 Fiberwire; Arthrex Inc, Naples, FL) were passed through the tendon and muscle stump in a Mason–Allen configuration across the tear. A patch of dermal allograft matrix (Arthrex Inc, Naples, FL) was

Table 1. Patient-reported outcome measures

	Postoperative score at 5-year follow-up
PROMIS Upper Extremity	44.8 ± 2.8
PROMIS Pain Interference	38.7 ± 5.6
PROMIS Pain Intensity	30.7 ± 4.5
American Shoulder and Elbow Surgeon Score	98.33
Subjective Shoulder Value	90

PROMIS, Patient-Reported Outcomes Measurement Information System.

Table 2. ROM at 5-year follow-up

	Right arm	Left arm
Forward flexion	160°	160°
Extension	65°	65°
Abduction	170°	160°
ER (arm at side)	30°	55°
Internal rotation (arm at side)	T2	T3

placed over the repair, anchored to the tendon and muscle side with interrupted sutures (Fig. 3C). Passive intraoperative shoulder motion demonstrated the IS muscle-tendon unit to move as a single unit.

The arm was placed in a sling with an abduction pillow in neutral rotation for 6 weeks postoperatively. Passive ROM was started at 2 weeks followed by active-assisted ROM after 6 weeks. At 3 months, rotator cuff strengthening exercises (isometric followed by isokinetic) were initiated.

Outcome

The patient did well after surgery with considerable pain relief (9/10 to 1/10) by the 2-week time point. At the 6-month follow-up, she was pain free and recovered her preoperative ROM with 5-/5 strength in ER. At the latest 5-year follow-up visit, the patient reports no pain, 5-/5 strength in ER and no other limitations (Fig. 2B; Tables 1 and 2).

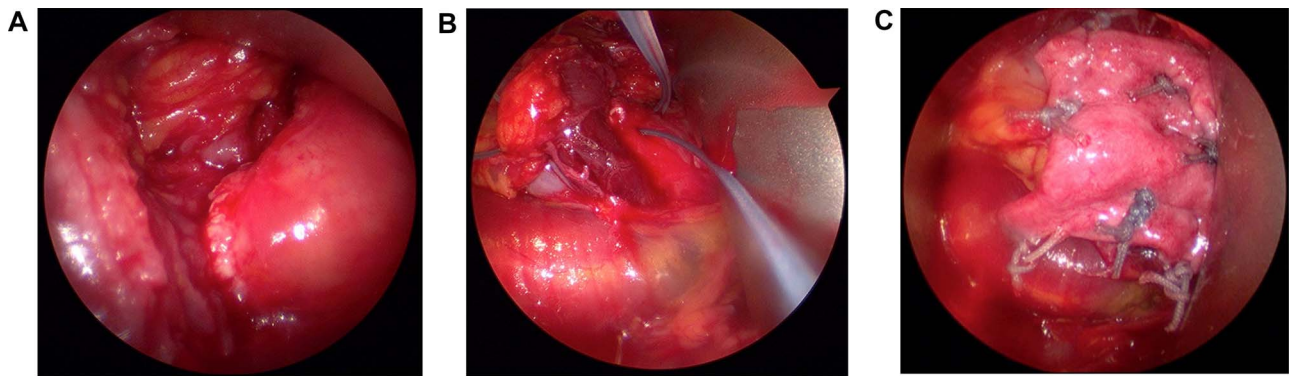


Figure 3. The infraspinatus tear at the myotendinous junction was identified arthroscopically (A) and tagged with a suture to ease identification during open repair (B). Following muscle to tendon repair across the tear in a Mason–Allen configuration, the repair was reinforced with a dermal allograft patch incorporated over the tear (C).

DISCUSSION

In respect to the etiology and surgical outcomes of isolated IS tears, there are several important points that make this case report unique and worthy of discussion. Though previous studies have reported on isolated MTJ lesions of the IS muscle, they are often described as a strain or partial tears with full-thickness tears only reported at the insertional footprint [1, 4–8]. As such, Walch *et al.* [1], Lunn *et al.* [6] and Taneja *et al.* [7] have evaluated the unique findings of IS tears at the MTJ. They reported a primarily atraumatic etiology and an association with calcific tendinitis; on magnetic resonance imaging (MRI), muscle edema is seen acutely with fatty infiltration progression during the chronic stages of injury [1, 6, 7]. The index patient in this report had an atraumatic onset with a full-thickness IS tear at the MTJ with symptom worsening in the immediate period after a steroid injection, which has not been reported previously.

Though nonoperative and primary surgical repairs have been described for isolated IS tears, there is no consensus on ideal treatment. Lunn *et al.* [6] reported no improvement with surgical repair in their series and recommended against surgical repairs. Walch *et al.* [1] reported surgical repairs of lateral repair (supraspinatus to teres minor), medialized repair of the stump or direct repair with outcomes non-superior to nonoperative treatment. Surgical treatment with graft augmentation has not been described for this condition as this is the first report of long-term pain relief and good functional outcomes following open repair of an IS MTJ tear with dermal allograft augmentation.

The other interesting aspect of this case report is related to the etiology of the RCT. Steroid injections have been associated with collagen degeneration, as well as tendon rupture in preclinical and clinical studies [9–14]. Interestingly, our patient noted an acute worsening of shoulder symptoms after steroid injection. Although we did not have an MRI prior to worsening of symptoms, we believe her tear was acute based on the presence of muscle edema. However, the etiologic association between MTJ tears and steroid injection cannot be established based on one case. Previous studies by Walch *et al.* [1]

and Lunn *et al.* [6] have reported on a history of steroid injections prior to isolated IS lesion diagnosis, but these case series also report their treatment using steroids. The index patient also had a venous varix in the SG notch, which was considered in the etiology but aspiration of the varix did not relieve the patient's pain. Carroll *et al.* [15] have reported on venous varix malformation in the SG notch as a cause of shoulder pain and IS muscle atrophy.

CONFLICT OF INTEREST STATEMENT

The authors of this paper certify that they have no affiliations with or involvement in any organization or entity with any financial or non-financial interests in the subject matter or materials discussed in this manuscript.

FUNDING

This study was funded by NYU Langone Health. No external funding was received.

REFERENCES

- Walch G, Nové-Josserand L, Liotard JP, Noël E. Musculotendinous infraspinatus ruptures: an overview. *Orthop Traumatol Surg Res* 2009;**95**:463–70.
- Spargoli G. Supraspinatus tendon pathomechanics: a current concepts review. *Int J Sports Phys Ther* 2018;**13**:1083–94.
- Melis B, Wall B, Walch G. Natural history of infraspinatus fatty infiltration in rotator cuff tears. *J Shoulder Elb Surg* 2010;**19**:757–63.
- Kolbe AB, Collins MS, Sperling JW. Severe atrophy and fatty degeneration of the infraspinatus muscle due to isolated infraspinatus tendon tear. *Skelet Radiol* 2012;**41**:107–10.
- Brown T, Barton RS, Savoie FH 3rd. Reverse humeral avulsion glenohumeral ligament and infraspinatus rupture with arthroscopic repair: a case report. *Am J Sports Med* 2007;**35**:2135–9.
- Lunn JV, Castellanos-Rosas J, Tavernier T, Barthélémy R, Walch G. A novel lesion of the infraspinatus characterized by musculotendinous disruption, edema, and late fatty infiltration. *J Shoulder Elb Surg* 2008;**17**:546–53.

7. Taneja AK, Kattapuram SV, Chang CY, Simeone FJ, Bredella MA, Torriani M. MRI findings of rotator cuff myotendinous junction injury. *AJR Am J Roentgenol* 2014;**203**: 406–11.
8. Fitzpatrick S, Reynolds AW, Purnell G. Arthroscopic repair of an isolated infraspinatus tear in a contact athlete: a case report. *J Orthop Case Rep* 2019;**9**:7–10.
9. Ramírez J, Pomés I, Cabrera S, Pomés J, Sanmartí R, Cañete JD. Incidence of full-thickness rotator cuff tear after subacromial corticosteroid injection: a 12-week prospective study. *Mod Rheumatol* 2014;**24**:667–70.
10. Giovannetti de Sanctis E, Franceschetti E, De Dona F, Palumbo A, Paciotti M, Franceschi F. The efficacy of injections for partial rotator cuff tears: a systematic review. *J Clin Med* 2020;**10**:51. Published 2020 Dec 25.
11. Vallone G, Vittorio T. Complete Achilles tendon rupture after local infiltration of corticosteroids in the treatment of deep retrocalcaneal bursitis. *J Ultrasound* 2014;**17**:165–7. Published 2014 Jan 29.
12. Ford LT, DeBender J. Tendon rupture after local steroid injection. *South Med J* 1979;**72**:827–30.
13. Kleinman M, Gross AE. Achilles tendon rupture following steroid injection. Report of three cases. *J Bone Joint Surg Am* 1983;**65**: 1345–7.
14. Stannard JP, Bucknell AL. Rupture of the triceps tendon associated with steroid injections. *Am J Sports Med* 1993;**21**: 482–5.
15. Carroll KW, Helms CA, Otte MT, Moellken SM, Fritz R. Enlarged spinoglenoid notch veins causing suprascapular nerve compression. *Skelet Radiol* 2003;**32**:72–7.