

# Arthroscopic Intramuscular Side-to-Side Repair of an Isolated Infrapinatus Tear



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**Abstract:** Intramuscular, full-thickness rotator cuff tears are uncommon and present a challenging clinical scenario for repair because traditional suture anchor or transosseous repair techniques are less feasible. The goal of repair is to achieve a tension-free reduction of both ends of the muscle to allow for adequate healing over time. Intramuscular tears of the infrapinatus specifically have rarely been reported. The clinical presentation of these patients can be challenging to interpret, and other causes of rotator cuff dysfunction, including compression to the suprascapular nerve, must be ruled out. In this Technical Note, we describe our technique for arthroscopic side-to-side suture repair of an isolated intramuscular infrapinatus tear.

The overall incidence of intramuscular infrapinatus tears is relatively low. Depending on the tear pattern on magnetic resonance imaging (MRI) and the symptoms of the patient, surgery may be indicated as first-line treatment in some cases. Earlier surgical intervention is often recommended for musculotendinous tears because, over time, tissue quality may degrade and muscle retraction can occur. Intramuscular, full-thickness rotator cuff tears are uncommon and present a challenging clinical scenario for repair because traditional suture anchor or transosseous repair techniques are less feasible (Figs 1-3). The goal of repair is to achieve a tension-free reduction of both ends of the muscle to allow for adequate healing over time. Side-to-side rotator cuff repairs using high-strength nonabsorbable suture material have been previously described with good success.<sup>1</sup> These repairs may be

conducted using interrupted or uninterrupted suture techniques as described in the literature.<sup>2</sup> Although myotendinous rotator cuff tears have been described,<sup>3-5</sup> intramuscular tears of the infrapinatus specifically have rarely been reported. Whereas muscle atrophy with absence of tears has been reported in the infrapinatus muscle,<sup>5</sup> to our knowledge, an intramuscular isolated infrapinatus tear or repair strategy has not been reported previously. The clinical presentation of these patients can be challenging to interpret, and other causes of infrapinatus dysfunction, including compression to the suprascapular nerve, must be ruled out. Nonoperative treatment may be attempted, but ultimately, if the patient remains symptomatic, surgical management is required.

In this Technical Note, we describe our technique for arthroscopic side-to-side suture repair of an isolated intramuscular infrapinatus tear. A summary of the technique is provided in Video 1.

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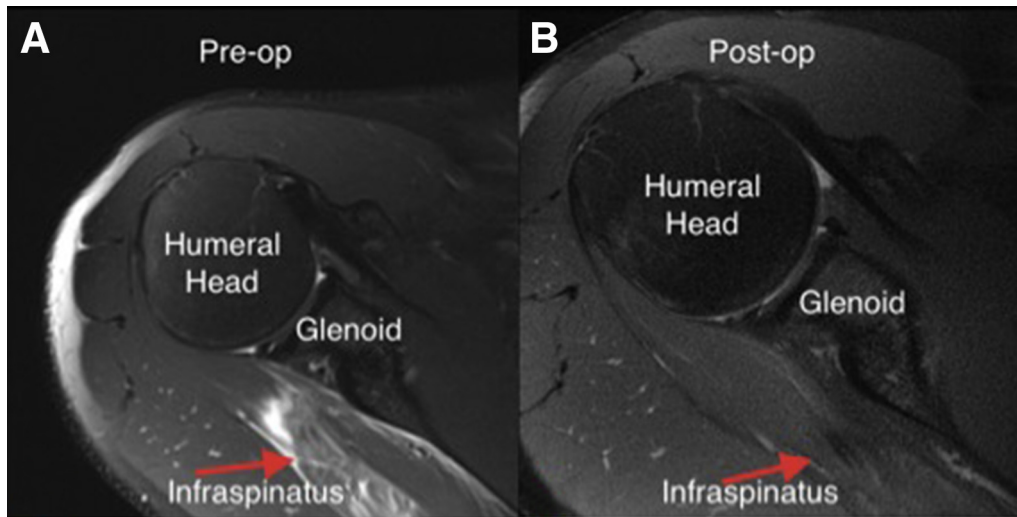
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## Technique

### Indications

Given the relatively low overall incidence of intramuscular infrapinatus tears, the indications for arthroscopic side-to-side suture repair are not well described in the literature. For most patients, indications for surgery include persistent pain and/or weakness after failure of nonoperative treatment in the form of activity medication, physical therapy, and in some cases, injections. A 25-year-old right hand-dominant man presented with initial complaints of



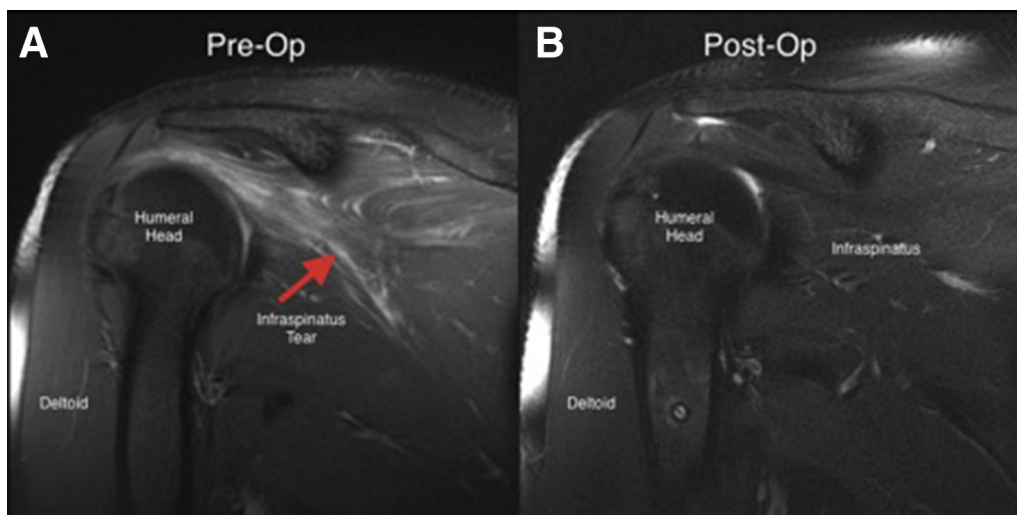
**Fig 1.** (A) Preoperative (Pre-op) axial view of a T2-weighted magnetic resonance image of the right shoulder showing a full-thickness infraspinatus tear. (B) Same axial slice of a T2-weighted magnetic resonance image of the right shoulder taken at 6 months postoperatively (Post-op) showing repair of the aforementioned isolated infraspinatus tear.

atraumatic right shoulder pain. He was managed non-operatively with subacromial-space corticosteroid injections and physical therapy. Several months after his initial presentation, he was passing a basketball and felt acute anterior shoulder pain, which was exacerbated by overhead activities and became associated with pain at night while sleeping. The physical examination findings were remarkable for atrophy throughout the infraspinatus fossa as well as decreased strength in external rotation; the patient also had moderate tenderness in the bicipital groove. MRI showed a full-thickness tear of the infraspinatus muscle at the myotendinous junction with notable fatty infiltration within the muscle belly; the supraspinatus and subscapularis

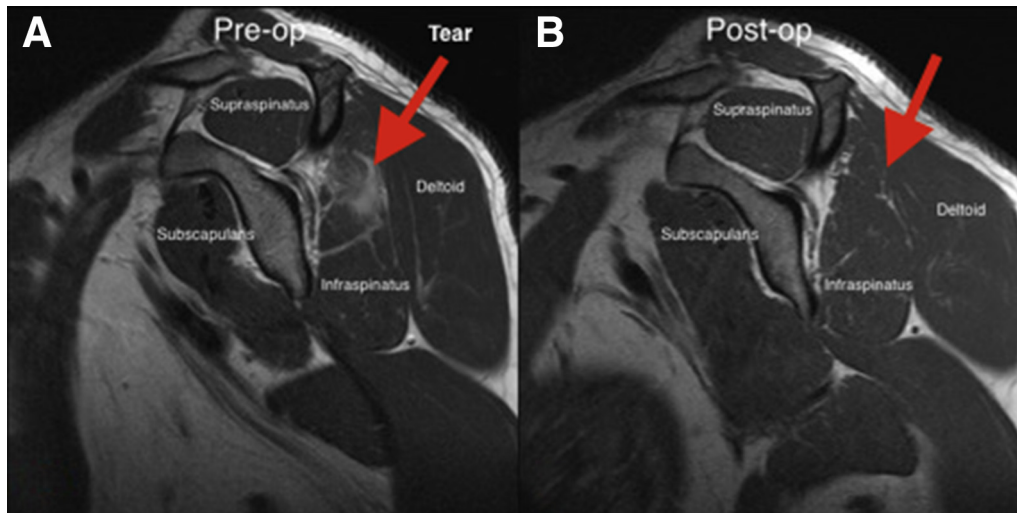
muscles and tendons were intact (Figs 1-3). In light of the patient's symptoms, examination findings, and imaging findings and the failure of nonoperative treatment strategies, we recommended an arthroscopic side-by-side rotator cuff repair.

#### Patient Positioning and Anesthesia

We routinely administer both regional anesthesia through an interscalene block and general endotracheal anesthesia. We position the patient in the beach-chair position with the scapula stabilized with rolled towels between the scapula and the operating table. Preparation and draping are performed in sterile fashion, and intravenous antibiotics are given before incision.



**Fig 2.** (A) Preoperative (Pre-Op) coronal T2-weighted magnetic resonance image of the right shoulder showing the full extent of the intramuscular infraspinatus tear. (B) Six-month postoperative (Post-Op) coronal T2-weighted magnetic resonance image of the right shoulder showing repair of the intramuscular infraspinatus tear.



**Fig 3.** (A) Preoperative (Pre-op) sagittal T1-weighted magnetic resonance image of the right shoulder showing the intramuscular, full-thickness isolated infraspinatus tear. (B) Same T1-weighted magnetic resonance imaging slice of the right shoulder taken at 6 months postoperatively (Post-op) showing repair of the infraspinatus tear.

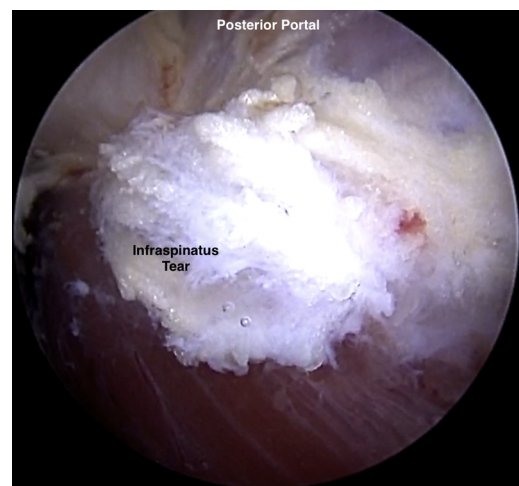
### Diagnostic Arthroscopy

We use a mechanical arm holder (Trimano; Arthrex, Naples, FL) to place the surgical arm in line with the body, with slight anterior traction. We use a standard posterior portal that is localized 2 cm inferior and 1 cm medial to the posterolateral corner of the acromion. By use of an outside-in-technique, a standard anterior midglenoid portal is established through the rotator interval just lateral to the coracoid process. Diagnostic arthroscopy and a careful evaluation of the rotator cuff are performed. Slight abduction with forward elevation can improve visualization of the undersurface of the rotator cuff. If the patient is noted preoperatively to have had positive physical examination findings and complaints consistent with long head of the biceps tendon pathology, the long head of the biceps tendon is released from its insertion on the superior glenoid for subsequent tenodesis. The remaining rotator cuff tissue, including the infraspinatus on its articular surface and the subscapularis, as well as the other intra-articular structures, including the labrum and the articular cartilage of the humeral head and glenoid, is carefully evaluated and managed appropriately.

### Surgical Technique

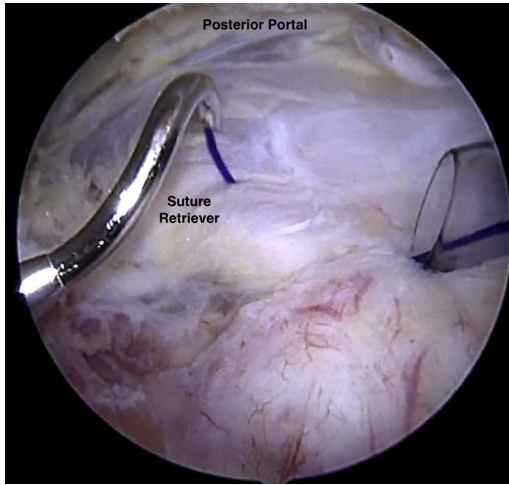
After diagnostic arthroscopy, the arthroscope is inserted from the posterior portal into the subacromial space, and a lateral portal at the mid-acromial line, just posterior to the acromioclavicular joint, is established 2 to 3 cm lateral to the acromion by use of spinal needle localization. A thorough subacromial decompression, including elevation of the coracoacromial ligament off the anterior margin of the acromion, is performed. We then perform an acromioplasty using a posterior cutting-block technique. After adequate subacromial

decompression, thorough evaluation of the bursal aspect of the rotator cuff is performed. In this case, there is a visible disruption of the myotendinous junction of the infraspinatus tendon (Fig 4). This disruption comes off of the tendon insertion as it wraps around the corner of the humerus and proceeds posteriorly toward the spine of the scapula (Video 1). We use sequential No. 2 FiberTape suture tapes (Arthrex), which are placed in a side-to-side fashion, beginning at the most anterior-lateral position, thereby bringing the tendon and muscle out to length (Figs 5-8). Viewing from the lateral portal, the surgeon introduces a reusable curved Spectrum suture passer (ConMed, Largo, FL) from the posterior portal to pierce

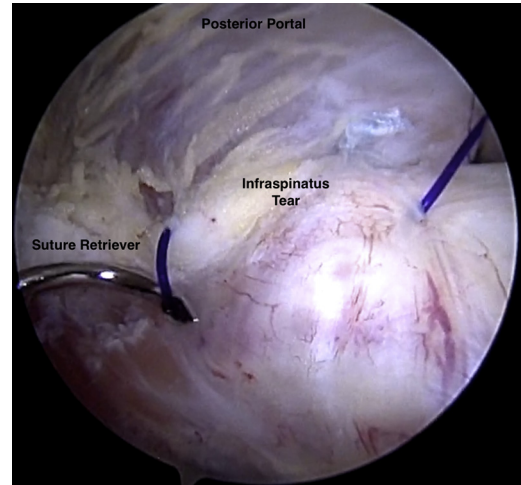


**Fig 4.** Intraoperative arthroscopic image of the right shoulder (beach-chair position) viewed through a standard posterior portal showing a large intramuscular, full-thickness infraspinatus tear.





**Fig 5.** Intraoperative arthroscopic image of the right shoulder (beach-chair position) viewed through a standard posterior portal showing passage of the first of 5 polydioxanone sutures for side-to-side repair with a curved suture passer.



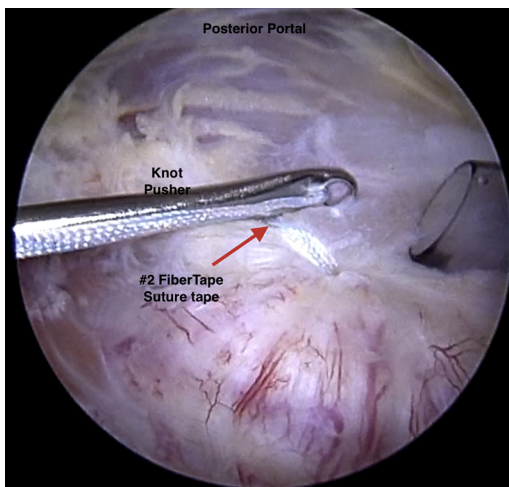
**Fig 7.** Intraoperative arthroscopic image of the right shoulder (beach-chair position) viewed through a standard posterior portal showing a curved suture retriever placing the second of 5 side-to-side repair stitches.

through the 2 ends of the tendon tear; a No. 1 polydioxanone suture (PDS; Ethicon, Cincinnati, OH) is passed and retrieved anteriorly. A simple knot is tied on the PDS, and FiberTape is passed through the loop, which is then pulled tight to shuttle the tape through the tendon. This FiberTape is tied using standard arthroscopic knot-tying techniques with reverse posts and alternating half-hitch knots. Five suture tapes in total are used to create an anatomic reconstruction of the infraspinatus myotendinous junction (Figs 9 and 10). When indicated, this is followed by a mini-open subpectoral biceps tenodesis, performed through a 2-cm incision along the anterior-inferior aspect of the patient's axilla (Fig 11). The

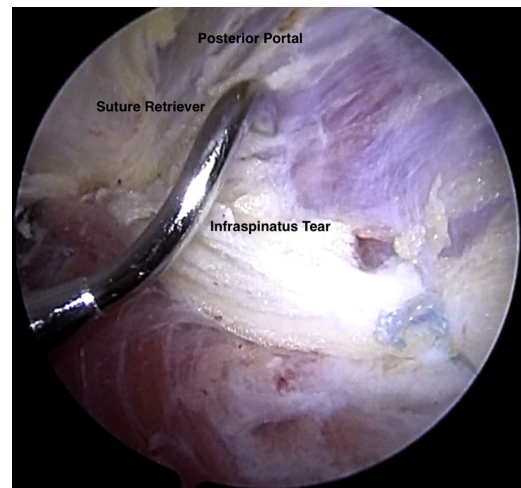
senior author's (A.A.R.) preferred technique for this procedure has been described previously.<sup>6,7</sup> The wounds are then closed by standard techniques, and the patient's arm is placed into a sling with an abduction pillow. Pearls and pitfalls of the technique can be found in Table 1, and advantages and disadvantages can be found in Table 2.

### Rehabilitation

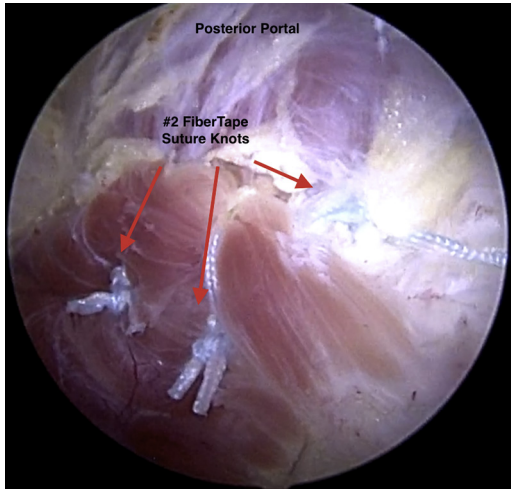
Our standard rotator cuff repair rehabilitation protocol is used for patients undergoing intramuscular side-to-side repair of an isolated infraspinatus tear. Patients are maintained in a sling with an abduction pillow for the first



**Fig 6.** Intraoperative arthroscopic image of the right shoulder (beach-chair position) viewed through a standard posterior portal showing a knot pusher tying down the first of 5 side-to-side No. 2 FiberTape suture tape repair stitches that has been placed.

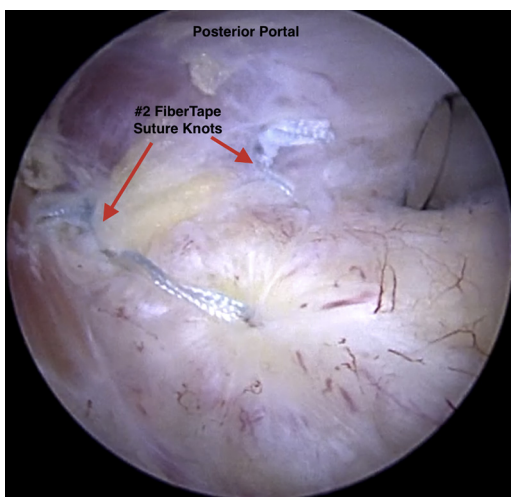


**Fig 8.** Intraoperative arthroscopic image of the right shoulder (beach-chair position) viewed through a standard posterior portal showing a curved suture retriever moving into position for placement of the fourth of 5 side-to-side repair stitches to achieve an anatomic repair of the full-thickness infraspinatus tear.

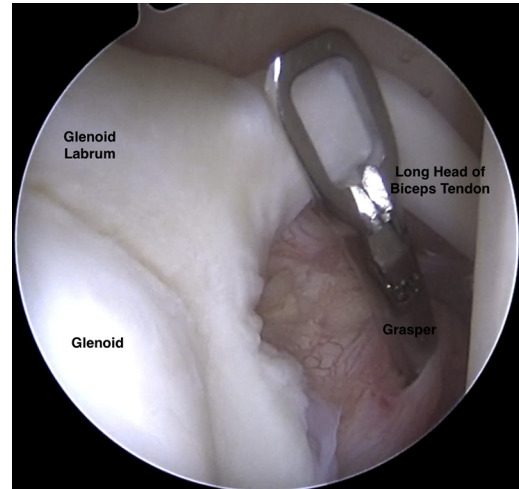


**Fig 9.** Intraoperative arthroscopic image of the right shoulder (beach-chair position) viewed through a standard posterior portal showing the 3 most medial side-to-side No. 2 FiberTape suture tape repair stitches achieving an anatomic repair of a full-thickness infraspinatus tear.

6 weeks, with gentle pendulum exercises permitted immediately after surgery. Physical therapy is initiated in the first postoperative week, with passive range of motion for the first 6 weeks with a goal of 140° of forward elevation, 40° of external rotation with the elbow at the side, and up to 60° to 80° of abduction with the arm in neutral rotation. Once use of the sling is discontinued at 6 weeks, patients are allowed to begin active-assisted and active range of motion including periscapular muscle strengthening. At 8 weeks, light resistive training is allowed with the elbow at the side. Gentle strengthening is allowed at 12 months, with sport-specific rehabilitation exercises allowed at 4.5 months.



**Fig 10.** Intraoperative arthroscopic image of the right shoulder (beach-chair position) viewed through a standard posterior portal showing the 2 most lateral side-to-side No. 2 FiberTape suture tape repair stitches achieving an anatomic repair of a full-thickness infraspinatus tear.



**Fig 11.** Intraoperative arthroscopic image of the right shoulder (beach-chair position) viewed through a standard posterior portal showing a large arthroscopic grasper in position to cut the long head of the biceps tendon from its insertion point.

## Discussion

Isolated infraspinatus tears are rare injuries that present similarly to a muscle strain, often resulting from indirect trauma and associated with complaints of significant shoulder pain and weakness with external rotation.<sup>5</sup> Advanced imaging modalities may show muscle atrophy; however, in the acute phase, a significant inflammatory reaction may be seen. As with other rotator cuff tear patterns, significant muscle atrophy is highly suggestive of a tendon tear.<sup>5,8</sup> Notably, atrophy of the infraspinatus can be associated with a supraspinatus tear,<sup>9</sup> and certainly, other causes of infraspinatus muscle atrophy, including suprascapular nerve compression or injury, need to be ruled out.

**Table 1.** Pearls and Pitfalls of Presented Surgical Technique

### Pearls

- Using a tagging suture to mark the pathologic undersurface of the rotator cuff will aid in identifying any bursal-sided pathology.
- A thorough subacromial decompression will improve visualization.
- Arthroscopic cannulas in the subacromial space will reduce fluid escape and improve subacromial-space distention.
- A curved suture-passing device will improve accuracy with arthroscopic suture passage.
- The tendon should be reduced while passing suture to ensure proper suture placement.
- Suture tape may improve the strength of the repair.

### Pitfalls

- Failure to thoroughly debride the subacromial space and obtain hemostasis will limit visualization of the torn rotator cuff.
- Failure to make tight and secure knots will decrease repair integrity.
- Failure to maintain the cannula within the subacromial space can increase the risk of a tissue bridge during knot tying.

**Table 2.** Advantages and Disadvantages of Presented Surgical Technique

Advantages
Anatomic reduction of the rotator cuff tear can be achieved.
Use of suture tape will improve fixation strength.
Anchorless repair will reduce surgical cost and time.
Disadvantages
Arthroscopic suture passage using a curved device can be technically difficult.
The tissue at the musculotendinous junction may be delicate.

Intramuscular, full-thickness infraspinatus tears are uncommon. In general, tears at the musculotendinous junction are difficult to manage.<sup>5</sup> Repairing the tissue using a side-to-side technique with nonabsorbable suture tape can successfully restore the infraspinatus muscle length-tension relation with an anatomic repair. Earlier surgical intervention is recommended for these musculotendinous tears because, over time, tissue quality will degrade and muscle retraction will occur. If surgery is significantly delayed, an anatomic repair may not be possible.

In conclusion, an intramuscular, full-thickness infraspinatus tear is a rare but potentially debilitating injury to the musculotendinous junction of the infraspinatus that can result in significant pain, atrophy, and weakness. An expedited workup including early MRI and a comprehensive history and physical examination will help identify this injury. Early surgical intervention with an anatomic repair using the described technique can result in a successful outcome.

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