New Complication Associated With All-Inside Meniscal Repair Device

Ultrasound-Aided Diagnosis and Operative Localization of Foreign Body Reaction

Lucian C. Warth,* MD, Matthew J. Bollier,† MD, Douglas F. Hoffman,‡ MD, Justin S. Cummins,‡ MD, and Mederic M. Hall,†§‖ MD

Investigation performed at University of Iowa Hospitals and Clinics, Iowa City, Iowa, USA

Background: The importance of meniscal preservation has become widely accepted, and meniscal repair techniques have evolved over recent years. With new techniques come new complications, which are critical to recognize.

Purpose: To describe a new complication of foreign body reaction from a nonabsorbable suture anchor associated with improper placement of the all-inside meniscal device.

Study Design: Case series; Level of evidence, 4.

Methods: This study was a retrospective review of 3 patients who developed pain associated with a foreign body reaction from a misplaced all-inside meniscal device.

Results: All patients had a delayed diagnosis (6 months to 8 years) and negative magnetic resonance imaging (MRI). Diagnostic ultrasound identified the misplaced suture with foreign body reaction and was used to guide a diagnostic injection of local anesthetic prior to surgical intervention. Intraoperative ultrasound guidance was utilized to precisely localize and excise the suture material and associated reactive tissue.

Conclusion: Foreign body reaction from a misplaced all-inside meniscal device is a previously unreported complication. Diagnosis is challenging as MRI and arthroscopy can be unrevealing. Diagnostic ultrasound was able to identify the foreign body reaction, confirm the diagnosis by facilitating diagnostic local anesthetic injection, and guide surgical excision. Sonographic evaluation should be considered in patients presenting with ongoing knee pain after all-inside meniscus repair.

Keywords: knee arthroscopy; meniscus repair; diagnostic ultrasound; postoperative complications

The importance of meniscal preservation has become widely accepted, and meniscal repair techniques have evolved over recent years. Described options include inside-out, outside-in, and arthroscopic all-inside options. Although inside-out suture repairs remain the gold standard against which other techniques are compared, minimally invasive techniques have improved over recent years, and arthroscopic all-inside meniscal repair has become commonplace. In addition to excellent short-term outcomes associated with these techniques, including 80% to 96% successful repair, all-inside options eliminate the need for additional incisions, decrease risk to neurovascular structures, can decrease operative time, and may eliminate the need for an experienced assistant.[1,5] While there are several benefits to the all-inside technique, there is an associated increased cost and there have been various unique complications reported, including component breakage, parameniscal and ganglion cyst formation, saphenous neuropathy, aseptic synovitis, and device migration with chondral damage.[1,3,5-7]

To the best of our knowledge, there have been no prior reports of foreign body reaction to nonabsorbable suture or

‖Address correspondence to Mederic M. Hall, MD, University of Iowa Sports Medicine, 2701 Prairie Meadow Drive, Iowa City, IA 52242, USA (email: mederic-hall@uiowa.edu).

*Department of Orthopedic Surgery, Indiana University Health, Fishers, Indiana, USA.

†Department of Orthopedics and Rehabilitation, University of Iowa Sports Medicine, Iowa City, Iowa, USA.

‡Department of Orthopedic Surgery, Essentia Health, Duluth, Minnesota, USA.

§Department of Radiology, University of Iowa Hospitals and Clinics, Iowa City, Iowa, USA.

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anchor associated with improper placement of the all-inside meniscal device. The authors have found that diagnosis and treatment of this complication can be difficult as these patients have often had multiple advanced imaging studies and even procedures over a number of months before definitive diagnosis of superficially implanted anchor irritation as the primary pain generator. We describe the use of ultrasound imaging in the diagnosis and treatment of superficial anchor irritation—a unique complication associated with common all-inside suture meniscal repair. Three cases are reported as well the use of ultrasound-assisted diagnostic injection and operative localization for minimally invasive foreign body excision. This case series was deemed exempt from institutional review board approval.

CLINICAL CASES

Case 1

A 28-year-old female presented to the clinic with continued medial knee pain 8 years after medial meniscus repair at an outside institution using a meniscal all-inside device (unknown device). Prior to presenting to our office, 2 magnetic resonance images (MRIs) demonstrated possible medial meniscal retear versus postsurgical changes. The patient subsequently underwent 2 diagnostic arthroscopies, including a meniscal debridement without significant relief of symptoms. On presentation to our office, she was quite frustrated with persistent medial knee pain that was limiting activities and normal function. She had posteromedial joint line tenderness and a positive Tinel sign at the medial joint line in the saphenous nerve distribution. We reviewed arthroscopy images and MRIs and did not see any structural pathology that could account for her pain. We ordered a diagnostic ultrasound specifically to examine the saphenous nerve.

Ultrasound evaluation demonstrated nonabsorbable meniscal suture material located just posterior to the medial collateral ligament (MCL) and anterior to the semimembranosus tendon (Figure 1). Adventitial bursal tissue surrounded the suture material, and there was reproduction of typical pain symptoms with direct sonopalpation including a positive Tinel sign in a saphenous distribution. While no discrete saphenous neuroma was identified, a branch of the nerve appeared to course in the region of the bursal tissue. Diagnostic injection of local anesthetic infiltrated under live sonographic guidance resulted in complete resolution of pain and restoration of normal gait. After discussing treatment options with the patient, including corticosteroid injection versus surgical excision of the foreign body reaction and saphenous neurolysis with intraoperative ultrasound guidance, the patient elected to proceed with the more definitive treatment option given the chronicity of her symptoms.

Intraoperatively, ultrasound was used to identify the foreign body and surrounding reactive tissue, and an 18-gauge spinal needle was guided to the suture material. An approximately 2-cm longitudinal incision centered at the 18-gauge needle was then made, followed by blunt dissection to the posterior aspect of the superficial MCL. Suture material reaction as well as a piece of the all-inside device that was covered in reactive tissue was excised (Figure 2).

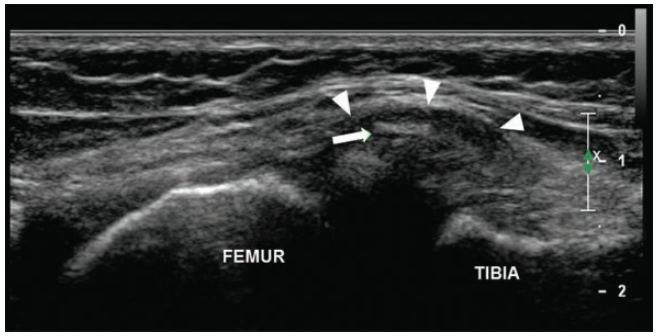

Figure 1. Case 1. Long-axis sonogram over the posteromedial knee, just anterior to the semimembranosus tendon. Arrow demonstrates hyperechoic meniscal suture material. The surrounding hypoechoic tissue (arrowheads) represents inflammatory tissue reaction/adventitial bursa.

Figure 2. Case 1. Intraoperative photograph. Resected suture material on left and inflammatory bursal tissue on right.

At 6-week follow-up, the patient was found to have no tenderness, negative McMurray test, and full painless range of motion. She was discharged to follow-up as needed, with no further complaints at 2 years 4 months after surgery.

Case 2

A 41-year-old female with history of right knee pain and multiple surgeries, including lateral release and medial patellofemoral ligament (MPFL) reconstruction, presented to the clinic 6 months after medial meniscus repair using 2 Omnispan all-inside meniscal repair sutures (DePuy Synthes). Examination demonstrated medial joint line tenderness to palpation and pain with varus stress testing with a competent MCL.

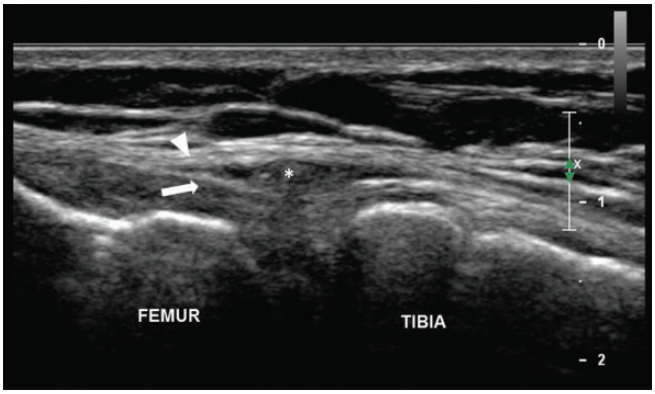

Figure 3. Case 2. Long-axis sonogram over the medial joint line. Inflammatory bursitis associated with meniscal suture material (asterisk) is seen lying between the superficial (arrowhead) and deep (arrow) layers of the medial collateral ligament.

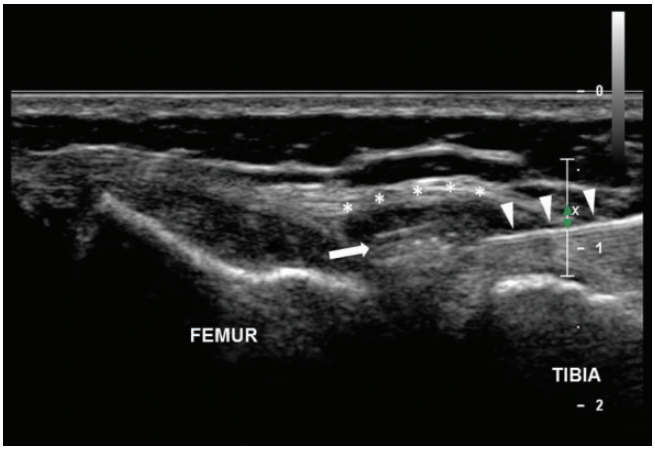

Figure 4. Case 2. Long-axis sonogram over the medial joint line. A 27-gauge (30-mm) needle (arrowheads) is used to infiltrate the bursa (asterisks) with 1% lidocaine for diagnostic purposes. The meniscal suture (arrow) is better visualized with surrounding hypoechoic injectate.

Ultrasound evaluation demonstrated hypoechoic tissue between the superficial and deep layers of the MCL, with nonabsorbable suture material at the center of this reactive bursa (Figure 3). Diagnostic injection (Figure 4) of local anesthetic and corticosteroid infiltrated under live sonographic guidance resulted in complete resolution of symptoms immediately postinjection, but the injection provided no lasting benefit beyond the local anesthesia. Thus, it was decided to proceed with surgical excision.

Intraoperatively, a similar technique was used to that described in case 1 to identify, mark, and excise the offending retained suture anchor and surrounding reactive tissue. Minimal medial compartment chondromalacia was appreciated, and the medial meniscus was felt to be healed from previous repair with probing.

At 6-week follow-up, the patient was found to have significantly improved tenderness medially, negative

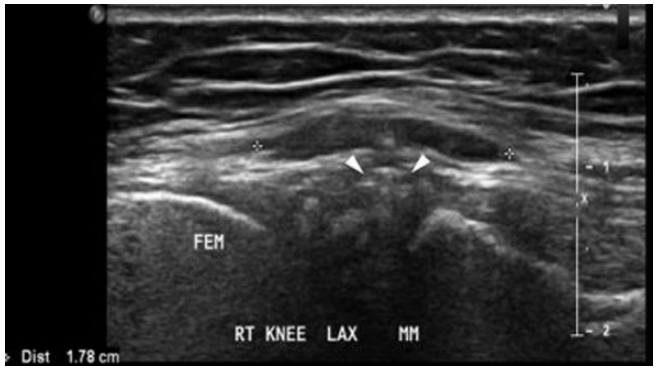

Figure 5. Case 3. Long-axis sonogram over the medial joint line demonstrating a "proud" suture anchor extending beyond the border of the medial meniscus (arrowheads) into the superficial medial collateral ligament with a resultant adventitial bursa (between calipers).

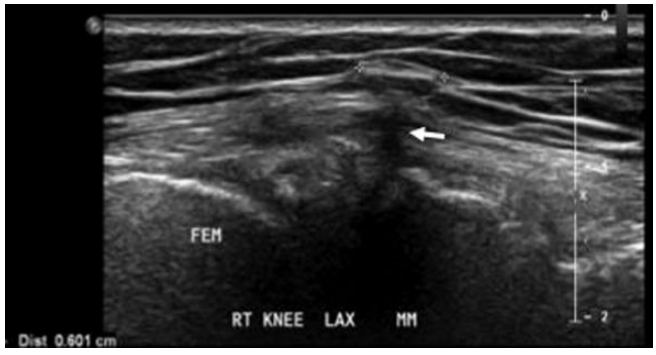

Figure 6. Case 3. Long-axis sonogram over the medial joint line demonstrating a suture fragment that has migrated into the subcutaneous tissue (between calipers). Note the hypoechoic migration path of the suture fragment (arrow).

McMurray test, and no pain with valgus stress testing. Her long-term follow-up was complicated by a subsequent significant meniscal retear 4 months postsurgery requiring surgical intervention.

Case 3

A 19-year-old female presented to clinic with focal medial knee pain and a painful posteromedial lump at the joint line 12 months after a bucket-handle medial meniscus tear repaired using 5 Meniscal Cinch all-inside meniscal repair devices (Arthrex). MRI revealed a new small posterior horn medial meniscus tear and irregularity at the meniscosynovial junction. Arthroscopy was performed, which demonstrated a well-healed meniscus from her previous bucket-handle tear but a new small white-white zone posterior horn medial meniscus tear, which was debrided. She was allowed to return to basketball but continued to complain of persistent sharp medial knee pain.

Subsequent sonographic evaluation demonstrated a proud suture anchor extending beyond the periphery of the

meniscus into the region of the MCL, resulting in an adventitial bursa (Figure 5), as well as migration of a suture fragment into the medial subcutaneous tissue (Figure 6). Sonopalpation confirmed that the maximal area of tenderness was directly over the adventitial bursa.

A repeat diagnostic arthroscopy was performed, and the meniscus was felt to be healed and stable to probing. No additional abnormalities were identified. A 2-cm medial incision was made over the previously marked point of maximal tenderness. An adventitial bursa as well as 3 suture anchors (2 still connected to the suture) were identified along the posterior border of the MCL. The bursa and foreign material were excised. At 6-week follow-up, the patient's symptoms had completely resolved. She had minimal tenderness to palpation, full range of motion, and was able to resume full activity with no restrictions. She was discharged to follow-up as needed with no further complaints 2 years after surgery.

DISCUSSION

While the reported complication rate after meniscal repair ranges as high as 45%, generally speaking, superficial complications are rare.[4,5] Subcutaneous migration of meniscal arrows after failed meniscus repair and cases of symptomatic bioabsorbable meniscal arrows resolving over the course of up to 6 months have been reported.[2] We report 3 cases of superficially implanted all-inside repair devices with symptomatic bursal formation and foreign body reaction from nonabsorbable anchors in the setting of a successfully repaired meniscus, as confirmed by second-look arthroscopy at the time of foreign body removal of the symptomatic anchor.

The current iteration of all-inside repair options includes devices that allow for appropriate suture tensioning, lower profile anchoring mechanisms, and bioabsorbable or nonabsorbable anchor options. The depth at which the nonabsorbable suture anchor is deployed is crucial and both surgeon and technique dependent. If the anchor is not implanted in adequate tissue, there is concern for device pullout, repair failure, and intra-articular damage. Our series suggests that if a nonabsorbable anchor is implanted too far from the meniscus capsular junction during medial meniscus repair using the all-inside technique, there can be significant and even debilitating irritation of the MCL, surrounding soft tissue, and branches of the saphenous nerve. We found clear reactive tissue formation to the foreign body in each case.

These 3 cases demonstrate a previously undescribed significant complication of MCL bursitis and nonabsorbable anchor irritation associated with improper placement of an all-inside meniscal device. Without an appropriate index of suspicion, definitive diagnosis can be difficult, as demonstrated in our cohort where time to diagnosis ranged from 6 months to 8 years and often included a number of inconclusive advanced imaging studies and unsuccessful operative procedures.

In our series, we found MRI imaging unhelpful in determining the ultimate diagnosis. MRI was neither able to identify the all-inside device nor was it able to identify the small focal region of reactive tissue, both of which were readily identified on ultrasound. The positive findings on MRI in our case series represented clinically insignificant meniscal abnormalities or normal postoperative changes based on lack of improvement with partial meniscectomy. The ability to perform precise ultrasound-guided diagnostic injection confirmed our diagnoses. In addition, ultrasound-aided localization techniques can be considered intraoperatively to decrease surgical time and minimize soft tissue injury.

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