Technical Note

In-Office Needle Arthroscopy with Meniscal Repair for Meniscal Lesions of the Knee

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Abstract: Meniscal injuries are a common cause of knee pain and are often an indication for knee arthroscopy, the most common orthopedic surgical procedure in the United States. In-office needle arthroscopy (IONA) is a described technique with the ability to diagnose and treat meniscal injuries in the office. IONA allows for diagnosis and treatment at a significantly deceased cost, with both quicker patient recovery, and improved patient satisfaction. The purpose of this technical report is to describe the technique for performing in-office needle arthroscopy for meniscal injuries of the knee, including the technique for obtaining adequate local anesthesia, proper indications, adequate visualization, and the advantages of performing these procedures in the office rather than the operating room.

Meniscal injuries are a common cause of knee pain and are often an indication for knee arthroscopy, the most common orthopedic surgical procedure in the United States.[1-7] Meniscectomy has been the gold standard treatment for many years; however, meniscal repair is growing in popularity for indicated lesions, particularly in patients under 25 years of age.[7-9] With the all-inside suture devices now available, meniscal repairs can be performed without additional incisions and in a less invasive fashion.[10,11] Traditionally, these procedures are performed in an operating suite using general or regional anesthesia. However, recent advances with in-office needle arthroscopy (IONA) have allowed for wide awake arthroscopic procedures for the treatment of meniscal injuries to be conducted in the office setting, without the need for either an operating room or an anesthesiologist.

Improving on prior IONA designs, this needle arthroscopic system with a 1.9-mm camera provides a semi-flexible, minimally invasive option for diagnostics, as well as therapeutic treatments in either the office or operating room setting. The needle arthroscope system has high-quality imaging with flexibility to adjust the tip up to 15°. The addition of various nanoarthroscopic instruments, such as 2.0-mm shavers, burrs, smaller probes, graspers, and scissors, allow for expeditious and minimally invasive procedures on the identified in-office pathology. Indications and contraindications for this procedure can be found in Table 1.

The purpose of this technical note is to describe in-office needle arthroscopy with meniscectomy and/or meniscus repair for the treatment of meniscal tears.We also describe obtaining adequate anesthesia, proper indications, visualization tips, and the advantages of performing these procedures in the office rather than in the operating room (Table 2). A step-by-step guide is presented in Table 3, with a subsequent video guide in Video 1.

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Table 1. Advantages and Disadvantages of Proposed Technique

Advantages	Disadvantages
Real-time assessment of meniscal lesions	Requires patient and staff buy-in
Reduced operating room utilization, avoidance of anesthesia complications	Learning curve with wide awake patient present and 0° camera
Opportunity for shared decision making	Difficulty accessing posterior lesions
Improved ability to accurately measure size, location, and depth of lesions	Potential for patient pain or discomfort
Faster recovery	

Surgical Technique

Preoperative Planning/Positioning

The patient is seated comfortably on an examination table in the supine position with the foot at the end of the bed. It is paramount to position the patient with enough space to flex the knee off the side of the bed (Fig 1). This allows gravity to open the joint space. No tourniquet is required for IONA wide awake procedures in order to avoid discomfort to the patient. The relevant arthroscopic surface anatomy of the knee is marked on the skin, including the distal pole of the patella, the medial and lateral borders of the patellar tendon, and the locations for the anterolateral and anteromedial arthroscopy portal sites (Fig 2). Prior to the procedure, the planned anterolateral and anteromedial arthroscopy portal sites are injected with 20 cc of 1% lidocaine (10 cc in each). After 5-10 minutes, another 20 cc of a 1:1 mixture of 1% lidocaine and 0.5% ropivacaine is injected into the knee joint through the anterolateral portal, both for anesthesia, as well as to confirm that the portal position allows adequate access to the knee joint. Using sterile technique, the extremity is prepped using a solution of chlorhexidine gluconate mixed with isopropyl alcohol and draped while the patient is supine.

Portal Placement

A standard anterolateral arthroscopic portal is made using a number 11-blade. The anterolateral portal is made 1-2 cm lateral to the patella tendon and 1-2 cm distal to the distal pole of the patella A 2-mm stab incision is made aiming toward the intercondylar notch to accommodate the 1.9-mm 0° viewing needle arthroscope (NanoScope, Arthrex, Naples, FL). No capsulotomy is performed in order to prevent discomfort to the patient, as well as to prevent extravasation of fluid through the portal around the needle instruments.

Operative Technique

A blunt trocar is then used to enter the joint under the patella into the suprapatellar pouch, with the knee in full extension in standard fashion. The camera is exchanged over the trocar and connected to the integrated inflow and outflow fluid management system at a pressure of 35 mmHg (DualWave; Arthrex, Naples, FL). Inflow consists of 1 Liter of 0.9% normal saline mixed with 5 cc of epinephrine, which promotes hemostasis for optimal visualization. A diagnostic arthroscopy is conducted, viewing the suprapatellar pouch, patellofemoral joint, lateral and medial gutters, medial compartment, notch, and lateral compartment (Fig 3). Next, the anteromedial portal is localized with a spinal needle, assuring access to the posterior medial meniscus and the lateral meniscus over the tibial spine. A single 2-mm stab incision is made with the number 11-blade, again without undercutting the capsule or bluntly spreading. The medial and lateral menisci are probed circumferentially to assess stability and identify

Table 2. Pearls and Pitfalls of the Proposed Technique

Pearls	Pitfalls
Having a dedicated procedure room with all required equipment	Not having all available assistants, instruments, and implants ready at beginning of procedure
Allocating at least 30 minutes of office time for the procedure	Requires proper indications of patients with understanding of expectations
Thorough preprocedure discussion with patient in regard to expectations for wide-awake procedures	Inadequate time between local anesthetic and procedure
Minimum of 10 minutes between portal and intra-articular local anesthetic injection and procedure	Suboptimal portal placement given 0° needle scope
Viewing portal opposite the lesion is ideal for instrumentation/delivery; i.e., needle arthroscope in an anterolateral portal for medial meniscus lesions	Difficult to treat posterior lesions without the ability to provide varus or valgus stress
Epinephrine in saline for hemostasis and visualization	Inadequate visualization
Thorough synovectomy around the lesion to achieve adequate visualization	

Table 3. Step-by-step Guide to Performing the Proposed Technique

Step 1: Position the patient comfortably in the supine position with the operative knee flexed over the table. Mark out relevant surface anatomy and anticipated portals (Figs 1 and 2).
Step 2: Deliver anteromedial and anterolateral portal local anesthesia and through these portals, the intra-articular block to minimize patient discomfort. Wait 10 minutes.
Step 3: Establish anterolateral portal about 0.5 cm lateral to standard arthroscopic portal.
Step 4: Perform diagnostic scope of the knee as needed per patient-physician discussion. Visualize lesion (Figs 3 and 4).
Step 5: Make anteromedial portal under direct visualization with standard arthroscopic technique, except with a single stab through skin and capsule without cutting superiorly.
Step 6: Ensure visualization portal and working portal allow adequate access to the meniscal lesion being treated, switch portals as necessary.
Step 7: Use a minimally invasive 2.0-mm shaver to remove infrapatellar fat pad, hypertrophic synovium, and any loose bodies necessary for wide visualization.
Step 8: Pass the all-inside suture anchor through to meniscus and capsule. Deploy the anchor and repeat in vertical mattress patten (Figs 5 and 6).
Step 9: Utilize a 2.0-mm shaver to contour edges, taking care not to debride healthy tissue
Step 10: Probe repair and meniscus to ensure stability (Fig 7).
Step 11: Apply wound closure (steri-strips) and soft dressing.

any disruptions. The needle arthroscope and a probe are placed in both portals and switched as needed to ensure adequate visualization and instrumentation of the meniscal lesions. A nanoscopic biter is used to remove any unhealthy tissue while a 2.0-mm shaver is used to debride and contour the meniscal edges.

If the tear is deemed reparable, then the meniscus is reduced with a probe, and the repair site is prepared with a meniscus rasp to promote a healing response (Fig 4). Next, the all-inside device (FiberStitch, Arthrex, Naples, FL) is set to a depth of 14-16 mm depending on the size of the patient and inserted. The meniscus is penetrated with the trochar through meniscus and capsule. It is paramount to ensure the needle has not pierced the skin prior to deploying the first anchor (Fig 5). The device is then pulled back and reinserted in either a vertical or horizontal mattress fashion dictated by the tear morphology, and the second anchor is deployed (Fig 6). The sutures are tightened and subsequently cut. Additional sutures can be placed, as needed, to obtain the required stability of the construct.

Fig 1. This is our standard in office needle arthroscopy knee setup. The bed is positioned to allow the patient to be seated comfortably in the supine position. The operative knee is prepped using a solution of chlorhexidine gluconate mixed with isopropyl alcohol and draped in standard fashion. Make sure to position the patient to allow for the operative knee to hang off the table to allow for gravity to open the joint space.

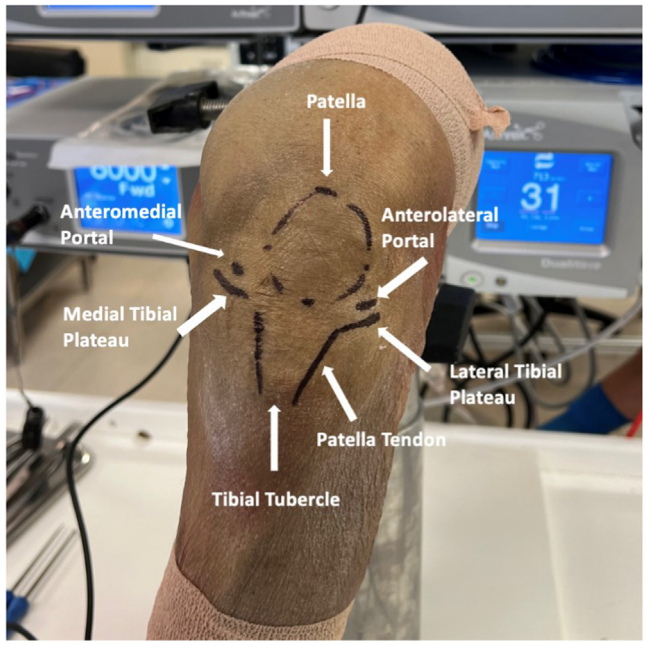

Fig 2. In the office arthroscopic approach to the knee via the anterolateral and anteromedial portals. Relevant surface anatomy markings include the anterior joint line, patella tendon, and patella. We recommend a slightly more lateral position of the anterolateral portal due to the 0° scope. This will be helpful in viewing the medial portal under direct visualization. Avoid performing a capsulotomy to prevent discomfort to the patient, as well as to prevent extravasation of fluid.

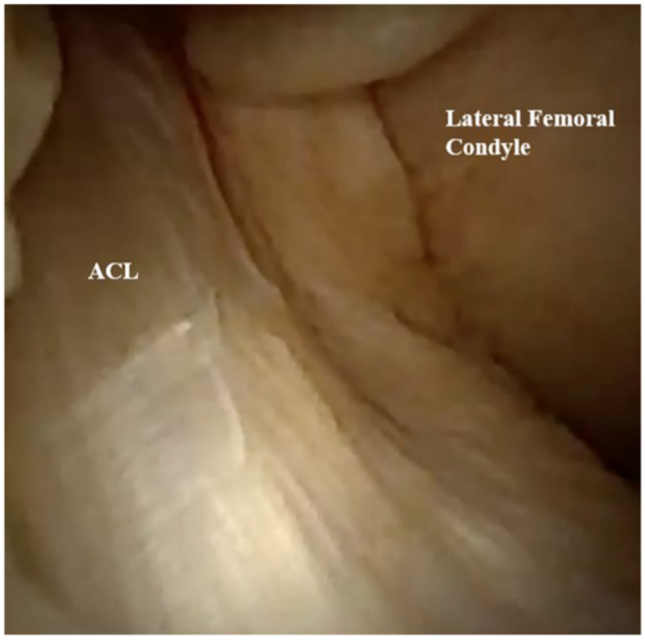

Fig 3. A diagnostic arthroscopy is performed. This is a needle arthroscopic view of the left knee from the anteromedial viewing portal. In this image the notch is visualized with the intact anterior cruciate ligament (ACL).

Fig 4. A needle arthroscopic view of the left knee from the anteromedial viewing portal. A horizontal medial meniscal tear can be visualized. A probe is used to test for stability of the tear and, if deemed repairable, the probe can be used to reduce the tear. A rasp can be used to prepare the site of repair to promote healing.

The stability and quality of the repair can be tested using a probe (Fig 7).

Portals can be sealed primarily using adhesive wound closure strips (Steri-Strip, 3M, Saint Paul, MN) or with simple nylon sutures if the surgeon feels they are necessary. A dry, sterile dressing is applied that facilitates early knee range of motion.

Postoperative Protocol

Postoperatively, if a meniscectomy is performed, then the patient is allowed to mobilize with full weight-bearing and full range of motion without restrictions. If a meniscus repair is performed, then the patient is instructed to partially weight bear for 4 weeks with a brace locked in extension. The brace may be adjusted to allow a range of motion from 0° to 90° when not ambulating. Full weight bearing is allowed at 6 weeks postoperative without range-of-motion restrictions. The patient is encouraged to apply ice and elevate the leg when not ambulating for the first 24−72 hours. No deep vein thrombosis prophylaxis or antibiotics are required. Acetaminophen and anti-inflammatories are sufficient for postoperative pain control. The patient returns on post-procedure day 5 and formal physical therapy is begun.

Discussion

Meniscal injuries are common and can be debilitating injuries.[2,6,7] IONA provides orthopedic surgeons with a useful tool to decrease morbidity and cost, increase patient satisfaction, and speed up recovery in the treatment of meniscal pathologies. Patel et al. reported a 20% false-positive finding of meniscal pathology on magnetic resonance imaging (MRI) interpretations.[12,13] As needle arthroscopy has become more widely available, in office needle arthroscopy has been described for diagnosis of intra-articular knee pathology with increased accuracy.[12] Additionally, needle arthroscopy has been described for the diagnosis and treatment of meniscal derangement, with high success.[12-15] These procedures, previously, were performed either for diagnosis in office, or in the operating room using either regional or general anesthesia and have frequently been performed with a tourniquet inflated. In this technical note, we describe the use of IONA to perform wide-awake meniscus repair for the treatment of a medial meniscal tear.

In office procedures provide patients a unique opportunity to visualize and participate in their care not afforded in the operating room under general anesthesia. Patients are able to participate in the intraoperative discussions and decision making, all while avoiding the anxiety provoking steps necessary to prepare a patient for the operating room. Shortening the diagnostic process, treatment wait, and allowing real time patient input has led to high patient satisfaction rates.[13,16,17] Moscato et al. reported increased patient

Fig 5. A needle arthroscopic view of the left knee from the anteromedial viewing portal. The all-inside device is set to a depth of 14-16 mm depending on the size of the patient and inserted through the anterolateral portal. The device is penetrated through the meniscus tissue and capsule. It is critical to ensure the needle has not pierced the skin prior to deploying the first anchor. If discomfort is felt, an analgesic cocktail can be injected directly into the capsule.

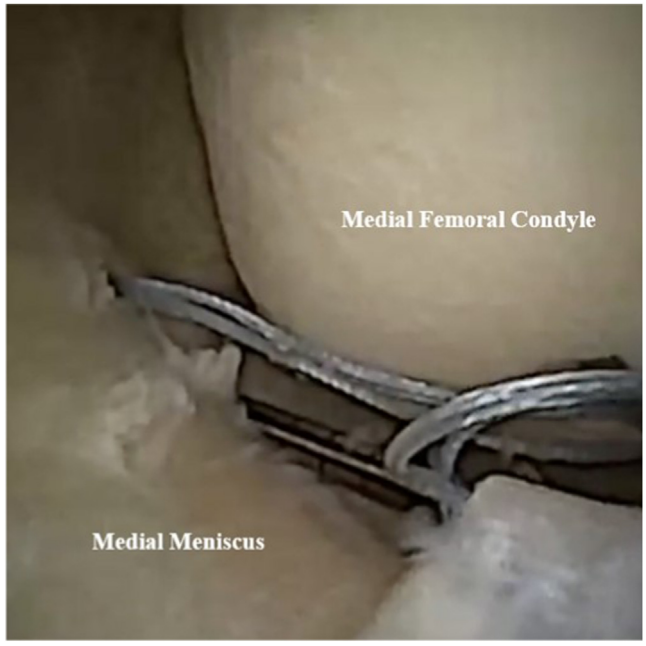

Fig 6. A needle arthroscopic view of the left knee from the anteromedial viewing portal. The all-inside device is then pulled back and reinserted in either a vertical or horizontal mattress fashion dictated by the tear morphology, and the second anchor is deployed. Once again, it is paramount to ensure that the needle has not pierced the skin prior to deployment of the anchor. The repair can be tested for stability using a probe and if deemed unstable, the previous steps can be repeated to introduce another layer of repair.

satisfaction scores in patients undergoing in office hand procedures utilizing wide-awake local anesthesia and no tourniquet when compared to operating room-based procedures.[18,19] Similarly, Colasanti et al. reported 94% of patients undergoing IONA treatment for anterior ankle impingement expressed a willingness to undergo the same procedure again.[20]

Finally, IONA offers the opportunity to decrease health costs of meniscal injury treatment. Amin et al. reported savings of $1,018 and $958 for Medicare and private pay, respectively, when using IONA versus MRI for just diagnosis of meniscal pathology.[21] In-office surgical hand procedures have been reported up to 4 times less expensive than when performed in the hospital setting.[22-24] Pearls and pitfalls of this technique are outlined in Table 1 to assist in optimal utilization.

Conclusions

We have found that our patients are extremely satisfied with IONA and express interest in the procedure while enjoying the experience of watching the arthroscopic feed with the surgeon. We feel this provides rapport and fosters a relationship with the patient that is beneficial to satisfaction and outcomes. The use of IONA allows patients to undergo not only diagnostic, but also therapeutic treatment of their meniscal

Fig 7. A needle arthroscopic view of the left knee from the anteromedial viewing portal. The stability and quality of the meniscal repair can be tested using a probe. If the final construct is deemed stable by the senior surgeon, the portal sites are closed using adhesive wound closure strips and a dry sterile dressing is applied.

pathology, while limiting hospital costs by reducing operating room utilization and expenses. Further studies are needed to evaluate clinical outcomes after IONA for meniscal pathology; nevertheless, the ability to treat these advancements is a promising way to treat one of the most common orthopedic pathologies.

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