Technical Note

In-Office Diagnostic Needle Arthroscopy Using the NanoScope™ Arthroscopy System

Hannah Bradsell, B.S., Alex Lencioni, M.D., Kevin Shinsako, MS, P.A.-C, and Rachel M. Frank, M.D.

Abstract: Diagnostic needle arthroscopy performed in office is a safe and cost-effective method for accurate evaluation of intra-articular pathology, improving clinical decision making. This minimally invasive approach is an effective alternative to traditional diagnostic techniques of diagnostic surgical arthroscopy and magnetic resonance imaging (MRI). Needle arthroscopy is considered low-risk, with an extremely low complication rate when performed with appropriate technique and indications. The purpose of this article is to describe an approach to an in-office diagnostic procedure using a needle arthroscopy system.

Introduction

In-office diagnostic needle arthroscopy has become increasingly popular as a feasible technique to accurately diagnose and treat intra-articular pathology, improving clinical and surgical decision-making and patient satisfaction. Notably, in-office needle arthroscopy has been shown to be a safe procedure with multiple studies documenting a 0% infection rate in both the shoulder and the knee. Further, in some settings, this procedure has been found to be statistically equivalent in both efficiency and accuracy when compared to diagnostic surgical arthroscopy, and more accurate than MRI, without increased complications. Real-time visualization of intra-articular pathology in an office setting can lead to reduced duration of time between diagnosis and ultimate management (whether surgical or nonsurgical), therefore, reducing time between injury and recovery. Indications for an in-office diagnostic needle arthroscopy of the knee include patients who are unable to obtain an MRI (i.e., due to a pacemaker, claustrophobia, etc.), patients with suspected intra-articular pathologies, including meniscal tears, chondral lesions, ligament tears, and loose bodies; and further, can be used for second-look arthroscopy following a variety of procedures, including meniscus and/or cartilage repair/restoration when MRI may not provide clear results. The purpose of this Technical Note is to describe a standard in-office needle arthroscopy technique using the NanoScope (Arthrex Inc., Naples, FL) arthroscopy system.

Surgical Technique

A demonstration of a diagnostic knee arthroscopy performed in an office setting using the NanoScope™ (Arthrex Inc.) arthroscopy system is presented in Video 1.

Preprocedure Evaluation and Processes

A thorough evaluation is performed on the patient, including medical history and physical examination. The patient undergoes standard weight-bearing radiographs of the knee, including anterior-posterior, lateral, merchant, and posterior-anterior flexion (Rosenberg) views, as well as bilateral long-leg weight-bearing alignment radiographs when indicated. MRI may be performed in addition to the needle arthroscopy when pathology of the bone (i.e., bone marrow edema-like reactions and/or bone involvement in osteochondral...
defects) and/or extra-articular anatomy, requires evaluation. Risks, benefits, and alternatives to the procedure are discussed with the patient, informed consent is obtained, and a procedural time-out is performed.

**Procedural Steps**

The patient is positioned supine on the examination table, and can either lie down on the table or sit up leaning against the back of the table or wall if they wish to observe the procedure. The NanoScope™ (Arthrex Inc.) console is placed in proximity to the patient area and facing the surgeon outside of the sterile field. The affected knee is preliminarily prepped with alcohol and chlorhexidine. The desired portal site (standard anterolateral or anteromedial portal) is identified, and a 25-gauge needle is used to inject local anesthetic at one or both portal sites, staying superficial at the skin, making a wheel.

![Fig 1. Clinical photograph demonstrating the authors' preferred approach to in-office needle arthroscopy (left knee). Standard anterolateral and anteromedial portals are shown. With the patient seated and the knee flexed to approximately 90 degrees, a 25-gauge needle is used to inject local anesthetic at one or both portal sites, staying superficial at the skin, making a wheel.](image)

Fig 1. Clinical photograph demonstrating the authors’ preferred approach to in-office needle arthroscopy (left knee). Standard anterolateral and anteromedial portals are shown. With the patient seated and the knee flexed to approximately 90 degrees, a 25-gauge needle is used to inject local anesthetic at one or both portal sites, staying superficial at the skin, making a wheel.

![Fig 2. Clinical photograph (left knee) demonstrating the lateral side of the knee prior to introducing the needle-scope. After the local anesthetic has been injected superficially, the knee is re-prepped with chlorohexidine, after which, sterile drapes are placed.](image)

Fig 2. Clinical photograph (left knee) demonstrating the lateral side of the knee prior to introducing the needle-scope. After the local anesthetic has been injected superficially, the knee is re-prepped with chlorohexidine, after which, sterile drapes are placed.

![Fig 3. Clinical photograph (left knee) demonstrating the use of sterile drapes proximally (along the distal femur) and distally (along the proximal tibia), creating a sterile field prior to introduction of the needle scope.](image)

Fig 3. Clinical photograph (left knee) demonstrating the use of sterile drapes proximally (along the distal femur) and distally (along the proximal tibia), creating a sterile field prior to introduction of the needle scope.

![Fig 4. Clinical photograph (left knee) demonstrating introduction of the 2.2mm inflow NanoScope (Arthrex Inc.) sheath with sharp trocar through the anterolateral portal into the joint. After successful insertion into the joint, the trocar is removed, and the one-way stop valve is attached to the sheath. Next, the 1.9-mm NanoScope (Arthrex Inc.) is inserted through the sheath. A 30-cc syringe of sterile 0.9% normal saline is then connected to the one-way stop valve, and the saline is used to insufflate the joint.](image)

Fig 4. Clinical photograph (left knee) demonstrating introduction of the 2.2mm inflow NanoScope (Arthrex Inc.) sheath with sharp trocar through the anterolateral portal into the joint. After successful insertion into the joint, the trocar is removed, and the one-way stop valve is attached to the sheath. Next, the 1.9-mm NanoScope (Arthrex Inc.) is inserted through the sheath. A 30-cc syringe of sterile 0.9% normal saline is then connected to the one-way stop valve, and the saline is used to insufflate the joint.
the patella to the region of the distal patellar tendon prepped with chlorhexidine, and drapes are placed along the superior and inferior borders of this sterile field, creating a working space centered over the patella. Next, using an 18- or 20-gauge needle, ~20 cc of 0.25% Marcaine without epinephrine is injected into the joint (Figs 2 and 3). After a few minutes, the 2.2-mm inflow NanoScope™ (Arthrex Inc.) sheath with sharp trocar is inserted through the anterolateral (or anteromedial) portal into the knee joint, the trocar is withdrawn, the one way stop valve is attached, and the 1.9-mm NanoScope™ (Arthrex Inc.) is inserted (Fig 4). A 30-cc syringe of sterile 0.9% normal saline is then connected to the NanoScope™ (Arthrex Inc.) via the one-way stop valve, the valve is opened, and the saline is used to insufflate the knee. This is followed by the injection of additional saline, up to 90-100 mL total, injected as needed to insufflate the joint and improve visualization. The diagnostic arthroscopy of the knee is then performed on the basis of the patient’s clinical history, physical examination, and any previously obtained diagnostic imaging (Fig 5, A and B). Using the opposite portal, a NanoProbe™ (Arthrex Inc.) may be used to evaluate the pathology, particularly useful for sizing chondral defects and/or probing the meniscus (Fig 6). If necessary, the scope may be alternated between the anterolateral and anteromedial portal sites, depending on required visualization, although the authors preference is to maintain efficiency of the procedure by avoiding unnecessary withdrawal and subsequent reintroduction of the scope. At the conclusion of the procedure, all previously insufflated saline is aspirated via the stop valve, and the NanoScope™ (Arthrex Inc.) is removed (Fig 7). A sterile dressing with Steri-Strips, 4 × 4" gauzes, and an ace-wrap is then applied. The post-procedural plan includes permitted weight-bearing and range of motion, as tolerated, and the use of acetaminophen and/or NSAIDs for pain control. No narcotics are prescribed post-procedure, and no sedatives are used before or during the procedure.

Discussion

Traditional diagnostic arthroscopy has historically been considered the optimal technique arriving at a definitive diagnosis of intra-articular knee pathology. However, traditional knee arthroscopy requires a surgical procedure typically performed under general (or spinal) anesthesia, with associated costs and risks of complications. MRI has also traditionally been considered the optimal noninvasive diagnostic tool for both intra-articular and extra-articular knee pathology, and although MRI certainly has value as a diagnostic tool, it can be costly, time-consuming, difficult for some
patients to tolerate, and further, remains imprecise in comparison to arthroscopy, particularly for the identification and sizing of chondral lesions. Several studies have reported statistical equivalence, with respect to accuracy, sensitivity, and specificity, of diagnostic in-office needle arthroscopy compared to diagnostic surgical arthroscopy in detecting knee joint pathology. A minimally invasive needle-scope used in an office-based setting maintains the high level of accuracy of surgical arthroscopy, while reducing costs to the healthcare system, offloads the costs of regular use of MRIs, provides a point-of-care diagnosis, and reduces the time from injury to recovery. Further, McMillan and colleagues recently validated the safety of this procedure, reporting no major complications and a minimal risk of minor complications among 1,419 cases, which included shoulders and knees. Amin et al. recently performed a cost-analysis of in-office needle arthroscopy versus MRI and found that needle arthroscopy was the more cost-effective diagnostic tool. Further, patient-reported outcomes were evaluated over a 2-year period from baseline, and it was shown that needle arthroscopy resulted in similar outcomes compared with MRI. Combined with previously reported findings of MRI unreliability, the authors concluded that MRI resulted in more costly care compared to needle arthroscopy. Additional research has shown that the use of in-office needle arthroscopy in place of MRI has several potential additional benefits in addition to saving the healthcare system money. These include shortening the diagnostic process for patients, allowing their active participation for improved understanding of their condition; high patient satisfaction rates; better preparing surgeons for definitive surgical procedure(s) when needed; and eliminating unnecessary, higher risk outpatient arthroscopy procedures simply to get a diagnosis.

In-office needle arthroscopy is not without limitations. Most importantly, with a lack of continuous fluid flow during the procedure, visualization may be impacted, possibly decreasing the diagnostic accuracy. In addition, while not overly painful, some patients may not tolerate being awake for such a procedure. The pearls and pitfalls of this technique are outlined in Table 1, and the advantages and disadvantages are listed in Table 2. In summary, using in-office needle arthroscopy as a diagnostic tool is a safe and effective alternative to surgical arthroscopy or MRI for evaluation of intra-articular knee pathology. A standard technique has been described here using the NanoScope™ (Arthrex Inc.) arthroscopy system.

### Table 1. Pearls and Pitfalls for Performing Diagnostic Arthroscopy Using In-Office Needle Arthroscopy

| Pearls                                                                 | Pitfalls                                             |
|-----------------------------------------------------------------------|------------------------------------------------------|
| Additional saline beyond initial insufflation may be used to improve visualization by serially injecting saline through the NanoScope™ (Arthrex) cannula. | Patients with multiple knee surgeries have too much arthrofibrosis for appropriate visualization. |
| Give adequate time for incisional and intra-articular block to set up before proceeding. | Patient compliance and motion may decrease diagnostic accuracy. |
| Utilizes clinic time and staff.                                        |                                                      |

### Table 2. Advantages and Disadvantages of Performing Diagnostic Arthroscopy Using In-Office Needle Arthroscopy

| Advantages                                           | Disadvantages                                      |
|------------------------------------------------------|----------------------------------------------------|
| Shorter delay in definitive diagnosis.                | Increased risk compared to MRI alone.              |
| Decreased operative burden and anesthesia for patients. |                                                    |
| More accurate and real-time diagnosis for patients.  |                                                    |
| Disadvantages                                        |                                                    |
| Can interfere with clinic workflow, consume staff time, and clinical resources. |                                                    |
| Learning curve for provider and staff in clinic.     |                                                    |
| Can cause patient pain and/or discomfort.            |                                                    |

### References

1. McMillan S, Chhabra A, Hassebrock JD, Ford E, Amin NH. Risks and complications associated with intra-articular arthroscopy of the knee and shoulder in an office setting. *Orthop J Sports Med* 2019;7:232596711986984.
2. Gauci M-O, Monin B, Rudel A, Blasco L, Bige B, Boileau P. In-office biceps tenotomy with needle arthroscopy: A feasibility study. *Arthrosc Tech* 2021;10: e1263-e1268.
3. Gill TJ, Safran M, Mandelbaum B, Huber B, Gambardella R, Xerogeanes J. A prospective, blinded,
multicenter clinical trial to compare the efficacy, accuracy, and safety of in-office diagnostic arthroscopy with magnetic resonance imaging and surgical diagnostic arthroscopy. *Arthroscopy* 2018;34:2429-2435.

4. Xerogeanes JW, Safran MR, Huber B, Mandelbaum BR, Robertson W, Gambardella RA. A prospective multicenter clinical trial to compare efficiency, accuracy and safety of the VisionScope Imaging System compared to MRI and diagnostic arthroscopy. *Orthop J Sports Med* 2014;2:2325967114S2325960010.

5. Dibartola AC, Rogers A, Kurzweil P, Knopp MV, Flanigan DC. In-office needle arthroscopy can evaluate meniscus tear repair healing as an alternative to magnetic resonance imaging. *Arthroscopy* 2021;3:e1755-e1760.

6. McMillan S, Saini S, Alyea E, Ford E. Office-based needle arthroscopy: A standardized diagnostic approach to the knee. *Arthrosc Tech* 2017;6:e1119-e1124.

7. Colasanti CA, Mercer NP, García JV, Kerkhoffs G, Kennedy JG. In-office needle arthroscopy for the treatment of anterior ankle impingement yields high patient satisfaction with high rates of return to work and sport. *Arthrosc Tech* 2022;9:e521-e525.

8. Patel KA, Hartigan DE, Makovicka JL, Dulle DL, Chhabra A. Diagnostic evaluation of the knee in the office setting using small-bore needle arthroscopy. *Arthroscopy Tech* 2018;7:e17-e21.

9. Daggett MC, Stepanovich B, Geraghty B, Meyers A, Whetstone J, Saithna A. Office-based needle arthroscopy: A standardized diagnostic approach to the shoulder. *Arthrosc Tech* 2020;9:e521-e525.

10. Amin N, McIntyre L, Carter T, Xerogeanes J, Voigt J. Cost-effectiveness analysis of needle arthroscopy versus magnetic resonance imaging in the diagnosis and treatment of meniscal tears of the knee. *Arthroscopy* 2019;35:554-562. e513.