

NanoScope™ Operative Arthroscopy System Scientific Updates



Arthrex has been revolutionizing orthopedics since the beginning of arthroscopy. The NanoScope arthroscopic system takes the next leap in arthroscopy by providing surgeons with breakthrough visualization technology for multiple orthopedic applications.

The rod-lens arthroscope has been the standard of care in the operating room for more than 40 years. Arthrex's all-in-one disposable, 2 mm, chip-on-tip camera system now allows surgeons to miniaturize their treatment solutions, taking arthroscopy to the next level. Along with the NanoScope camera, Arthrex has applied its vast experience with surgical instruments to develop disposable Nano arthroscopy instrumentation for use in the operating room, procedure treatment rooms, and physician clinics. Opening up procedure rooms for orthopedic treatment will enable Arthrex to lead a paradigm shift in orthopedic innovation.

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Stufkens SAS,
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Safety and Efficacy

[2-mm diameter operative tendoscopy of the tibialis posterior, peroneal, and Achilles tendons: a cadaveric study.](#) *Foot Ankle Int.* 2020;41(4):473-478. doi:10.1177/1071100719895504

A 2 mm-diameter arthroscopic system was used to perform a tendoscopic procedure in 10 nonpaired, fresh-frozen human ankles

- Several case series suggest that tendoscopic operative intervention results in a lower complication rate and faster recovery compared with open surgery.
- Currently available conventional rod-lens arthroscopes with a small diameter that are most convenient for tendoscopy are more prone to breakage than their larger bone peers, which decreases the appeal of tendoscopy, especially for purely diagnostic purposes.
- The newly released 2.0 mm, disposable, chip-on-tip camera is an alternative to rod-lens arthroscopy that could facilitate tendoscopy with a semirigid, durable combination of arthroscope and cannula.
- In all specimens, the inner tendon sheath of the tibialis posterior tendon was successfully visualized on all sides from its proximal to distal ends.
- It was possible to visualize the proximal end of the common tendon sheath in all peroneal tendons with a constant proximal vinculum present in all cases. More distally, both peroneal tendons were successfully inspected on all sides in their own tendon sheaths. While the peroneus brevis tendon was successfully inspected distally to its insertion, visualization of the peroneus longus tendon was distally restricted from the point where it curves beneath the cuboid.
- The Achilles tendon was easily visualized along its entire course from its insertion at the calcaneus to its proximal trajectory. Visual reach depended on portal placement with more proximally located portals needed for the inspection of more proximal areas, and vice versa for more distal parts.
- The image quality was high and all relevant structures were easily examined.
- None of the portal tracts came in contact with local neurovascular structures, and distances between portals and such tissue were sufficiently high.
- As with previous alternatives to rod-lens arthroscopes, the minimally invasive nature of 2 mm-diameter tendoscopy might better enable tendoscopic procedures under local anesthesia and eliminate the need for an operating room.
- In a cadaveric setting, 2 mm-diameter operative tendoscopy provided excellent visualization and safe operative reach of the tibialis posterior, peroneal, and Achilles tendons.



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(8):2429-2435. doi:10.1016/j.arthro.2018.03.010

- The study found that the accuracy, sensitivity, and specificity of in-office arthroscopy was equivalent to surgical diagnostic arthroscopy and more accurate than MRI when assessing the menisci, articular cartilage, and the patellofemoral joint in the knee.
- In-office diagnostic arthroscopy can provide a more detailed and accurate assessment than MRI for the diagnosis of intra-articular, nonligamentous knee joint pathology.
- MRI does not always accurately detect meniscal tears, the degree of osteoarthritis, or articular cartilage damage. Additionally, MRIs often fails to correlate with a physical examination of the joints.
- Needle-based in-office arthroscopy shows a decrease in costs compared to the current diagnostic and treatment paradigm.
- MRI had a lower agreement and lower performance statistic values compared to surgical diagnostic arthroscopy and in-office diagnostic arthroscopy.
- Based on the study results, in-office diagnostic imaging provides a “safe, accurate, real-time, minimally invasive diagnostic modality to evaluate intra-articular pathology without the need for surgical diagnostic arthroscopy or high-cost imaging.”

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[Two-millimetre diameter operative arthroscopy of the ankle is safe and effective.](#) *Knee Surg Sports Traumatol Arthrosc*. (2020) doi:10.1007/s00167-020-05889-7

- Study evaluated whether the newly introduced 2 mm-diameter arthroscope could effectively visualize and surgically reach all relevant structures in the anterior ankle joint without inflicting iatrogenic damage.
- Efficacy of surgical reach was determined in the anterior ankle joint space and on the articular surfaces of the talus and tibia.
- The anteromedial portal tract did not collide with neurovascular structures in any of the specimens.
- 2 mm-diameter arthroscopy, a novel alternative to conventional rod-lens arthroscopy, provides effective visualization and operative reach of the anterior ankle without inflicting iatrogenic damage when using the anteromedial and anterolateral portals.
- The entire anterior joint was visualized with the use of only one anteromedial portal.
- The potential need for only one safe portal for arthroscopic visualization supports the minimally invasive nature of 2 mm-diameter arthroscopy and might lower the barrier for its use.
- While a recent clinical study reported that macroscopically visible iatrogenic cartilage lesions are inflicted in 31% of all arthroscopic ankle procedures, no such iatrogenic damage was inflicted in the current study.
- It might allow for arthroscopy in a minimally invasive manner, under local anesthesia, either in the operating room or the outpatient office. Compared to current practice, this would allow for diagnostic, interventional, and second-look procedures to be performed at substantially reduced risk, time, and costs.



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McIntyre L,
Carter T,
Xerogeanes J,
Voight J

Economic Justification

Cost-effectiveness analysis of needle arthroscopy versus magnetic resonance imaging in the diagnosis and treatment of meniscal tears of the knee. *Arthroscopy*. 2019;35(2):554-562.e13. doi:10.1016/j.arthro.2018.09.030

- The study found that more costly care is provided when using MRI compared to needle arthroscopy.
- Costs were less for both Medicare and private pay for medial meniscus, \$780 to \$1862, and lateral meniscus, \$314 to \$1256, when comparing needle arthroscopic diagnosis to MRI diagnosis.
- Needle arthroscopy delivers equivalent accuracy to standard arthroscopies in diagnosis of meniscal and femoral condylar lesions.
- Additional benefits of needle arthroscopy include more timely and accurate treatment and less patient pain.
- Tears of the posterior horn and tears to less than one third of the lateral meniscus are difficult to identify with MRI. Using needle arthroscopy would likely result in quicker treatment of the tear and possibly less pain for the patient.

Applications

A change in scope: redefining minimally invasive. *Knee Surg Sports Traumatol Arthrosc*. 2020;10.1007/s00167-020-05898-6. doi:10.1007/s00167-020-05898-6

- In general, operative needle arthroscopy offers a minimally invasive technique with a skin incision less than 3 mm that requires only paper suture closure.
- This minimal portal footprint reduces local soft-tissue trauma and often obviates the need for any more than a local anesthetic—both factors that expedite patient recovery.
- Under these circumstances, smaller arthroscopic interventions can become bedside procedures performed in an office setting.
- Anterior and posterior ankle arthroscopy with debridement of osteophytes and cicatrized tissue is a producible technique that lends itself particularly well to operative needle arthroscopy.
- First metatarsal phalangeal joint limited cheilectomy and evaluation of chondral wear is another facile use. Tendoscopy of the Achilles, peroneal, and tibialis posterior tendons is an attractive and simple procedure with both diagnostic and therapeutic uses, allowing easy debridement using 2 and 3 mm shavers and augmenting repairs with biologic delivery systems.
- An obvious application in a trauma setting is postreduction visualization of intra-articular fractures. While obviating the need for high-pressure fluid inflow systems, it provides excellent visualization of intra-articular pathology, offering both a prognostic indicator and a means of delivering chondroprotective adjuncts if required.
- Operative needle arthroscopy may fulfill an invaluable role in cartilage evaluation at the time of injury and during second-look procedures after repair. It may assess the extent of damage and the quality and quantity of cartilage repair, a metric that MRI has some difficulty establishing.

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McMillan S,
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[Office-based needle arthroscopy: a standardized diagnostic approach to the knee.](#)

Arthrosc Tech. 2017;6(4):e1119-e1124. doi:10.1016/j.eats.2017.03.031

- MRI use has led to increased health care expenditures, larger financial burdens, and longer timelines for treatment.
- There are few instances in which an in-office diagnostic arthroscopy would be inferior to MRI. Such situations would be to evaluate suspected insufficiency fractures of the subchondral bone avascular necrosis or bony incorporation of a previously placed bone graft.
- Limiting factors preventing the use of MRI include patients who are morbidly obese, claustrophobic, or renally impaired and those who have implanted medical devices that are incompatible with MRI.

Zhang K,
Crum RJ,
Samuelsson K,
Cadet E,
Ayeni OR,
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[In-office needle arthroscopy: a systematic review of indications and clinical utility.](#)

Arthroscopy. 2019;35(9):2709-2721. doi:10.1016/j.arthro.2019.03.045

- Diagnostic accuracy was stratified by pathology among 248 patients with knee osteoarthritis, 107 with ACL tears, 107 with osteochondral defects, and 10 with synovitis.
- The similarity between views obtained in IONA and arthroscopy allows for the development of an operative plan with greater certainty and potential cost savings derived from decreased complication rates and operative times.
- In conjunction with diagnostic intra-articular injections of local anesthetic, IONA allows for direct visualization of injectate, minimizing the possibility of false positive results due to periarticular injections.
- IONA holds potential for cost savings and improved diagnostic accuracy relative to MRI, primarily for intra-articular meniscal, ligamentous, and chondral defects of the knee.