

In-Office Needle Arthroscopy for Anterior Ankle Impingement



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Abstract: Anterior ankle impingement is a common cause of chronic ankle pain characterized by altered joint mechanics with considerable deficits in range of motion. The benefits of in-office nano arthroscopy (IONA) include the ability to diagnosis and treat anterior ankle impingement, quicker patient recovery, reduced cost, and improved patient satisfaction. The purpose of this technical report is to describe the technique for performing in-office nano arthroscopy for anterior ankle impingement, with special consideration of 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.

Introduction

Anterior ankle impingement is a common cause of chronic ankle pain characterized by restricted dorsiflexion as a result of either tibiotalar osteophytes and/or soft tissue impingement.¹⁻³ It is particularly common in athletes who sustain repetitive dorsiflexion movements, but also common in patients who develop significant cicatrization tissue after ankle surgery.^{1,4} The gold standard procedure is ankle

arthroscopy surgery to remove osseous and soft tissue impingement in the operating room.⁵⁻⁸ However, advances with in-office nano arthroscopy (IONA) have allowed for wide awake arthroscopic procedures for the treatment of anterior ankle impingement without the need for either an operating room or an anesthesiologist.

Improving on previous IONA designs, a novel nano-arthroscopy system uses an optic chip at the camera tip and no inner rod lenses, providing image quality that is similar to conventional arthroscopy. This 1.9-mm arthroscope allows for a semi-rigid, durable combination of arthroscope and cannula that has the ability to visualize into the ankle joint and perform procedures under a local anesthetic in an office or bedside setting. Most importantly, this IONA technology includes various burrs, punches, graspers, scissors, probes, shavers, and resectors to permit direct intervention on identified pathology. Indications and contraindications for needle arthroscopy can be found in [Table 1](#). The purpose of this technical report is to describe the technique for performing in-office nano-arthroscopy for anterior ankle impingement, with special consideration of the technique for obtaining adequate local anesthesia, proper indications, adequate visualization, and the advantages of performing these procedures in the office rather than in the operating room. We recommend keeping in mind the advantages, disadvantages, and potential downsides when considering needle arthroscopy for a patient, and we have provided a

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Table 1. Advantages and Disadvantages of the Proposed Technique

Advantages	Disadvantages
Dynamic assessment of anterior ankle impingement	Potential for patient pain or discomfort
Reduced cost and resource utilization	Learning curve
Potential for improved patient satisfaction	
Improved ability to diagnose anatomic variants compared to MRI	

step-by-step guide to performing the technique below (Tables 2 and 3).

Surgical Technique

Preoperative Planning/Positioning

The patient is seated comfortably on an examination table in the supine position with the foot at the edge of the bed. The relevant surface anatomy of the ankle is marked on the skin, including planned anterolateral and anteromedial arthroscopy portal sites, as well as the location of the superficial peroneal nerve (Video 1).

Prior to the procedure, the planned anterolateral and anteromedial arthroscopy portal sites are injected with 1% lidocaine. After 5-10 minutes, another 6 mL of a 1:1 mixture of 1% lidocaine and .5% bupivacaine is then used to inject the ankle joint and confirm that the portal positions allow adequate access to the joint. In the case of anterior ankle impingement caused by osteophyte formation, an effort is made to inject the periosteum and fibrocartilage, so as to eliminate any potential pain from these sources. The patient either lies supine or sits with the operated ankle hanging over the edge of the table, and the patient's foot, ankle and lower leg are prepped for surgery and draped in a sterile fashion. This allows gravity to open the joint space. The surgeon and assistant then don a sterile mask, gloves, and a gown.

Portal Placement

Standard anteromedial and anterolateral arthroscopy portals are made using a number 11-blade (Fig 1). Small 2-mm stab incisions are made to accommodate

the 1.9-mm 0 viewing nano-arthroscope (NanoScope, Arthrex, Naples, FL).

Operative Technique

A blunt trocar is then used to enter the joint. The camera is exchanged over the trochar and connected to saline inflow, typically at a pressure of 20 mmHg. A diagnostic arthroscopy is conducted, alternating between both anteromedial and anterolateral portals. When medial impingement is identified, a 2.0-mm shaver is used to remove scar, soft tissue, synovial hyperplasia, and cicatrization, to optimize visualization of the anterior aspect of the joint (Figs 2 and 3). Attention is then directed to the tibia and talar neck; if any exostoses exist that may potentially cause impingement, they are resected using the 2.0-mm shaver or 3-mm burr (Fig 4). Patients do not typically experience any pain with this procedure, only a sensation of vibration (Fig 5). Finally, the ankle is put through a range of dorsiflexion and plantar flexion to evaluate for any remaining soft tissue or bony impingement.

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 ankle motion.

Postoperative Protocol

Postoperatively, the patient is allowed to mobilize with full weight-bearing, as tolerated using a rigid postoperative shoe. The patient is encouraged to perform ankle pumps and circumduction exercises every hour for 5 minutes for the first 24 hours. The patient is encouraged to apply ice and elevate the leg when not ambulating for 24-36 hours. The patient returns on day 5 following the procedure. Formal physical therapy is started on day 5 postoperatively.

Discussion

IONA is a useful tool to decrease patient morbidity, increase patient satisfaction, and speed up recovery when used appropriately. Here, we describe the use of an in-office nano-arthroscopy for the treatment of anterior ankle impingement. Nano-arthroscopy allows

Table 2. Pearls and Pitfalls of the Proposed Technique

Pearls	Pitfalls
Patient selection is critical.	Failure to provide adequate preprocedural local anesthesia or adequate time for anesthesia to take effect
Comprehensive discussion with patients regarding expectations for wide-awake procedure	Incorrect portal placement causing iatrogenic cutaneous nerve injury
Gentle traction as necessary to open joint space and facilitate access to the joint	Inadvertent damage to articular cartilage from nanoscope trochar
Adequate periosteal local anesthetic injection especially for patients with exostoses	Inadequate resection due to thick scar tissue inhibiting proper 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 foot free. Mark out relevant surface anatomy and anticipated portals.

Step 2: Deliver intra-articular block to the anteromedial and anterolateral portal sites. If bony work is anticipated, consider periosteal anesthetic injection to provide adequate patient anesthesia.

Step 3: Establish anteromedial and anterolateral portals with a superficial stab incision followed by blunt dissection.

Step 4: Perform diagnostic arthroscopy with systematic examination of anatomic structures.

Step 5: Using a minimally invasive 2.0-mm shaver to remove scar, soft tissue synovial hyperplasia, and cicatrization to optimize visualization of the anterior aspect of the joint.

Step 6: Attention is then directed to the tibia and talar neck; if any exostoses exist that may potentially cause impingement, resect using 2.0-mm shaver or 3-mm burr.

Step 8: Apply wound closure and soft dressing or splint as indicated.

patients to undergo a diagnostic and therapeutic procedure in the office setting and actively participate in the understanding of their condition. It also allows for savings in health care costs with operating room time, staff, anesthesia, and equipment.

Colasanti et al. performed a retrospective case series on 31 patients who underwent IONA treatment for anterior ankle impingement with a mean follow-up time of 15.5 months.⁸ Minimal clinically important difference (MCID) was achieved by 84% of patients according to the Foot and Ankle Outcome Score (FAOS) for pain, 77% for symptoms, 75% for quality of life, 74% for sports, 65% for Patient-Reported Outcome Measurement Information System Pain Interference, 61% for FAOS ADL, and 42% for Patient-Reported

Outcome Measurement Information System Pain Intensity. Additionally, 29 out of 31 patients (94%) expressed a willingness to undergo the same procedure again. Zengerlink et al. documented a 4% complication rate in 1,305 patients undergoing ankle arthroscopy, with the most common complications being neurologic.⁹ Similarly, Vega et al. established that approximately one-third of patients undergoing ankle arthroscopy sustained iatrogenic cartilage damage during the procedure.¹⁰ The benefit of the 1.9-mm arthroscope as opposed to the standard 4-mm arthroscope is that it reduces the risk of iatrogenic nerve injury and chondral damage when entering the joint. Using a smaller scope also causes less damage to the skin and subcutaneous tissue, which theoretically has

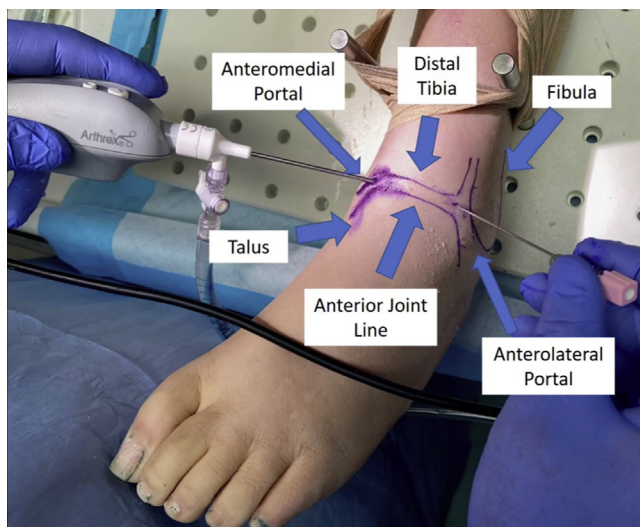


Fig 1. Arthroscopic approach to the left ankle via the anterolateral and anteromedial portals. Relevant surface anatomy markings, including the anterior joint line and portal locations, are shown. The anteromedial portal, which is the primary viewing portal, is placed lateral to the medial malleolus and medial to tibialis anterior tendon. One should be cautious to avoid the saphenous nerve and vein, as well as the tibialis anterior tendon. The anterolateral portal is made under direct visualization medial to the lateral malleolus. One should be cautious to avoid the superficial peroneal nerve, which is the most common neurovascular injury from ankle arthroscopy.



Fig 2. This is an arthroscopic view of the left ankle. Identification of superficial cartilage defect from repeated impingement from a hypertrophic AITFL is pictured here. A 2.0-mm shaver is used to remove scar, soft tissue synovial hyperplasia, and scar tissue in order to optimize visualization of the anterior aspect of the joint. AITFL, anterior inferior tibiofibular ligament.

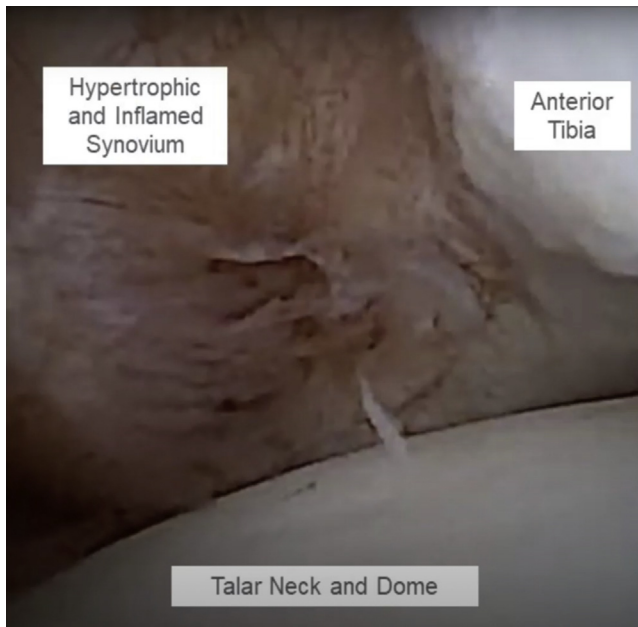


Fig 3. This is an arthroscopic view of the left ankle from the anterolateral portal site. Inflamed and hypertrophic synovium and scar tissue are pictured here. One may be able to appreciate the hypertrophic and inflamed tissue entering the joint space with active dorsiflexion of the ankle. The patient's ability to stay engaged permits them to actively range the ankle joint, allowing visualization of any area of impingement.

the advantage of limiting bacterial entry and the potential for subsequent infection.



Fig 4. This is an arthroscopic view of the anterior left ankle joint. Osteophyte and hypertrophic overgrowth causing impingement can be appreciated in this figure. A 3.0-mm burr can be introduced to resect the bony source of impingement.

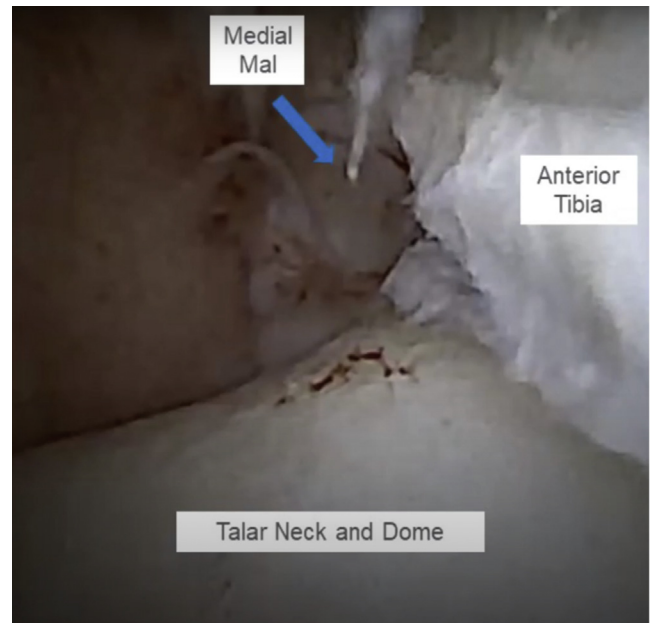


Fig 5. This is an arthroscopic view of the anterior left ankle joint. This figure demonstrates burring of the anterior tibia with the goal of resecting to the anterior border of the medial malleolus.

Furthermore, the use of IONA has the theoretical potential to limit hospital costs by reducing general anesthesia expenses and costs of maintaining the operating room and personnel, while at the same time reducing physician procedural fees. Previous literature has primarily focused on the diagnostic use of IONA compared to MRI.¹¹⁻¹⁵ McMillan et al. retrospectively reviewed 175 knee and 25 shoulder in-office nanoarthroscopic procedures and compared reimbursement for the IONA to the cost of the MRI for diagnosis.¹² IONA saved an average of \$418.08-\$961.08 per patient for knee evaluation and \$554.62-\$1,097.62 for shoulder evaluation.¹² Lastly, incorporating nanoarthroscopy in the office setting provides orthopaedic surgeons with a unique opportunity to improve patient satisfaction and build rapport with their patients. Previous work by MacNeill and Mayich demonstrated that patients have reduced anxiety with wide-awake foot and ankle surgery and, if given the choice, 87% would select wide-awake surgery for a subsequent procedure.¹ We have also found that our patients are very interested in the procedure and feel that watching the camera feed was a positive experience. Further studies are planned that will continue to evaluate subjective and objective outcomes in patients who have this surgery, as well as the potential costs savings for the hospital, surgeon, and patient.

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