

Wrist Nano Arthroscopy

Portal Placement and Evaluation Technique



Introduction

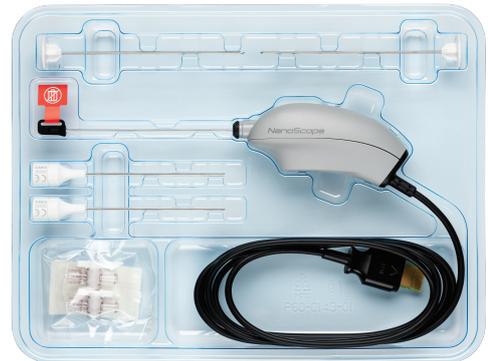
Arthrex introduces the first needle-sized operative system and instruments for nano arthroscopic and endoscopic surgery. The NanoScope™ visualization system is a 1.9 mm diameter chip-on-tip imaging technology that provides surgeons with an HD-quality image and field of view similar to a traditional 4 mm endoscope, as a sterile, single-use device. Additionally, with our new series of micro diameter instrumentation, surgeons can perform orthopedic or endoscopic procedures using 12-gauge, needle-sized instruments. Needle-sized portals through the skin allow surgeons to see and treat damaged structures in tighter joint spaces like the knee, elbow, wrist, and ankle. Nano arthroscopy and endoscopy also facilitate less invasive surgery in an ASC treatment room or physician's office under local anesthesia instead of traditional surgery with general anesthesia. The NanoScope system provides a real-time diagnostic option to MRI that allows the surgeon and patient to see joint anatomy together in one setting. The NanoScope system and Nano arthroscopy instrumentation provide treatment options for imaged-guided injections or micro resection of damaged anatomy such as partial soft-tissue repairs.



Wrist Portal Equipment and Supplies

Disposable Camera Kit

- Single-use camera
- 2 Inflow sheaths
- 1 Sharp trocar
- 1 Blunt trocar
- 2 Fluid stopcocks



NanoScope™ Tablet Control Unit

- 13" HD monitor
- Handpiece connector
- Microphone
- Ethernet, USB, and HDMI ports
- Wireless network capabilities



(Optional) Nano Arthroscopy Prep Kit

- (2) 10 cc Syringes
- 1 IV Bag adapter
- 15 Blade mini scalpel
- Disposable floor drape
- 2 Sterile towels
- 1 Elastic bandage

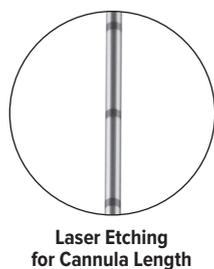
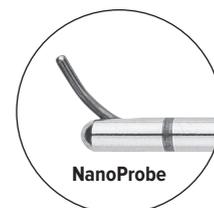
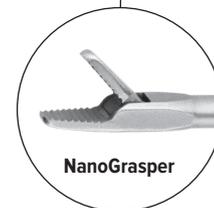


2.7 mm NanoCannula and Insertion Kit (Optional for Probe and Resection Instruments)

NanoCannula Insertion Recommendation

1. Insert calibrated 17-gauge spinal needle
2. Measure appropriate cannula length
3. Insert 18-gauge guidewire through needle. Remove the needle, keeping guidewire in place
4. Insert 2.7 mm cannula and obturator over the guidewire into the joint space
5. Remove guidewire and obturator, keeping cannula in place
6. Add Tegaderm™* transparent film dressing adhesive for hands-free usage, to prevent cannula fall out

*Tegaderm is a trademark of 3M Medical.



2 mm Wrist, Single-Use Sterile Resection Instruments (Optional)

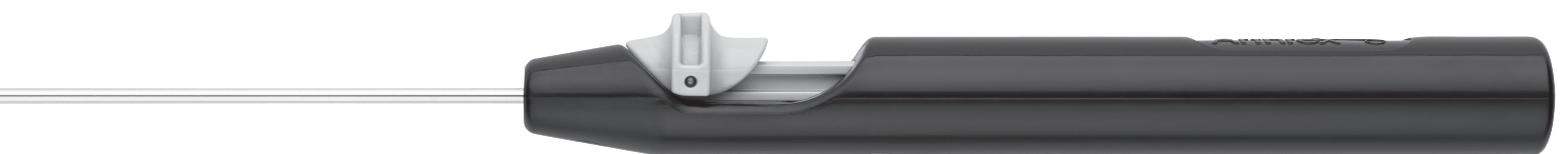
- NanoBiter punch
- NanoBiter punch, 15° up
- NanoGrasper
- NanoScissor
- NanoProbe
- Outflow cannula for tissue and fluid aspiration (optional)
- Short-acting local anesthetic (1% lidocaine), 10 cc



Small Joint NanoBiter Punch - 70 mm
(actual size)



Standard Length, Single-Use Nano Arthroscopy Instrument - 130 mm
(actual size)



Retractable NanoProbe (actual size)

Surgical Preparation

Room Setup and Patient Positioning

After obtaining informed consent from the patient, prepare the room for needle arthroscopy of the wrist. Place the patient in either a seated or supine position with sufficient room to allow easy accessibility to the standard wrist portal location and with the wrist in a neutral position. Place the display from the needle arthroscope within sight for the physician as well as the patient, who may wish to view the procedure. A secondary monitor can be connected with an HDMI cable.

Anesthetic Protocol

Clean the arm, forearm, wrist, and hand for a posterior portal location using a sterile preparation such as a chlorhexidine sponge. Place sterile finger traps and suspend the wrist in a well-padded traction system setup of no more than 7-10 pounds. Using a 10 mL syringe with a 25-gauge needle, infiltrate with the desired anesthesia into the skin and capsule to anesthetize the area and provide hemostasis. Allow 20 minutes for adequate local anesthesia and the hemostatic action to develop. If the patient feels pain at any time during the procedure, a second injection of local anesthetic mixture can be given.

Wrist Nano Arthroscopy – Establishing Initial Viewing Portal

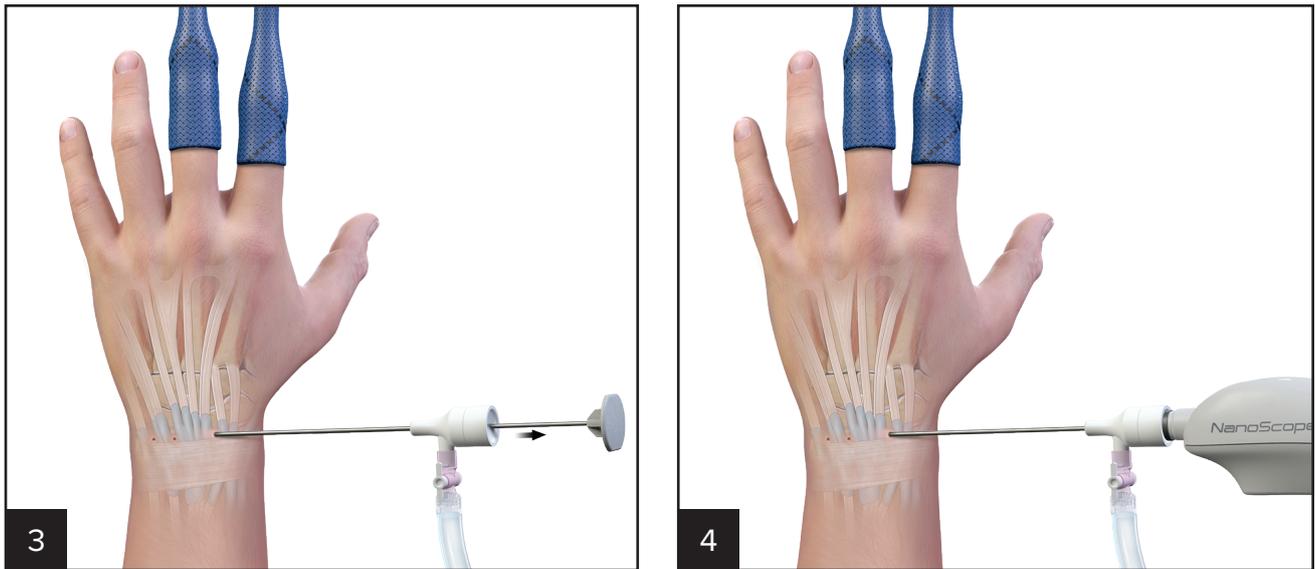


Preoperative wrist position and portals.



Insert the NanoCannula and trocar into the wrist joint to establish a dorsal 3-4 portal.

Wrist Nano Arthroscopy – Establishing Initial Viewing Portal (Cont.)



Using the blunt trocar, place the NanoCannula into the radiocarpal joint. Once the joint is entered, remove the needle sheath and insert the NanoScope™ camera. The NanoScope visualization system has a 0° viewing angle but a 120° field of view. If the view is blocked, inject saline into the joint using the 10 mL saline syringe to distract the joint space and remove obstructing tissue. In the OR or procedure room setting, an additional 4-5 or 6R portal can be created to admit a NanoCannula for insertion of an arthroscopic shaver to lavage the joint and improve visualization.

After insertion of the scope, a standard diagnostic arthroscopy is performed.

Diagnostic Arthroscopy

Start by examining the articular surfaces of the scaphoid and lunate facets of the distal radius. Moving from radial to ulnar, examine the articular surfaces of the adjacent scaphoid, lunate, and triquetrum. During this process, make note of the integrity of the radioscapohcapitate ligament, long and short radiolunate ligaments, ligament of Testut, and ulnocarpal ligaments including the ulnolunate and ulnotriquetral ligaments. Once inside the ulnocarpal joint, assess the integrity of the TFCC using the trampoline, hook, and suction tests.

Next, examine the midcarpal joint through standard ulnar and radial midcarpal portals. Examine the articular surfaces of the scaphoid, lunate, triquetrum, hamate, capitate, trapezoid, and trapezium. Using the NanoScope Nitinol or standard probe, assess the integrity of the scapholunate, lunotriquetrum, and capitolunate ligaments. Document any pathology discovered during the course of the procedure.

The dorsal radiocarpal portals are named in relation to the extensor tendon compartments they pass through, eg, the 3-4 portal is named as it lies between the 3rd (EPL) and 4th (EDC and EIP) extensor compartment tendons.

■ 3-4 Dorsal Radiocarpal Portal

This portal is located just distal to Lister's tubercle with a palpable soft spot in line with the 2nd webspace. A 22-gauge needle is used to identify this portal. The needle should be angled dorsal distal to volar proximal to account for the 11° of volar tilt of the distal radius. Optional: to aid with insufflation of the joint, 5 mL of normal saline can be injected into the joint through the needle using a 10 mL syringe. Once the location of the portal is found, make a small transverse incision in the skin only and using blunt dissection, separate tissue down to and puncture through the capsule, taking care to protect the adjacent extensor tendons, dorsal sensory nerves, and articular surfaces.

Place the NanoCannula and NanoScope camera into the radiocarpal joint to create a viewing portal.

Structures visualized include articular surfaces of the adjacent scaphoid, lunate, and triquetrum. After examining the articular surfaces, assess the integrity of the radioscapophcapitate ligament, long and short radiolunate ligaments, ligament of Testut, and ulnocarpal ligaments including the ulnolunate and ulnotriquetral ligaments. An accessory 4-5 or 6R portal can be created to permit passage of a 2 mm arthroscopic shaver and probe. Once inside the ulnocarpal joint, assess the integrity of the TFCC using the trampoline, hook, and suction tests.

To examine the scapholunate ligament, first identify the ligament of Testut and then back the NanoScope camera to the membranous portion of the scapholunate ligament and follow it dorsally. In a normal wrist, the dorsal capsule scapholunate ligament septum will attach onto the dorsal portion of the scapholunate ligament.

■ 4-5 Radiocarpal Portal

This portal is located between the 4th (EDC and EIP) and 5th (EDM) extensor compartment tendons in line with the ring finger metacarpal. Given the radial inclination of the distal radius articular surface, the portal sits proximal to the 3-4 portal.

This portal is typically used as a working portal for the instruments, but it can also be used as a visualization portal for the ulnocarpal joint or for dorsal ganglion excision.

■ 6R Radiocarpal Portal

This portal lies just radial to the 6th extensor compartment tendon (ECU), distal to the ulnar head and proximal to the triquetrum. To ensure the triquetrum is not injured, angle the NanoScope device proximally.

This portal is typically used as a working portal for instrument passage but can also be used as a visualization portal to the ulnocarpal joint including the lunate, lunotriquetral, triquetrum, TFCC, ulnolunate, and ulnotriquetral ligaments or for the management of dorsal ganglions.

■ 1-2 Radiocarpal Portal

This portal is located between the 1st (APL and EPB) and 2nd (ECRL and ECRB) extensor compartment tendons just distal to the radial styloid. Structures at risk include the dorsal sensory branches of the radial nerve, posterior branch of the LABC nerve, and the radial artery. As such, the portal is located within 4.5 mm of the radial styloid and no more than 4.5 mm dorsal to the 1st extensor compartment tendons. After placing a 22-gauge needle into the desired location, use blunt dissection to pierce the capsule with ulnar deviation of the wrist to guard against scaphoid injury.

This portal is typically used to aid in the debridement of the radial styloid or of a volar wrist ganglion. Take care during instrument passage to guard against injury to the underlying anatomic structures.

■ Dorsal Ulnar Midcarpal Portal

This portal is located midway between the 4-5 radiocarpal portal and the ring finger CMC joint. The soft spot is located ulnar and proximal to the capitate and distal to the LT joint and lies in the transverse plane. This will provide visualization of the articular surfaces of the triquetrum, hamate, capitate, lunate, and scaphoid as well as the scapholunate, lunotriquetral, and capitolunate ligaments.

■ Dorsal Radial Midcarpal Portal

This portal is located midway between the 3-4 radiocarpal portal and between the index and long finger CMC joints. The soft spot is located radial and proximal to the capitate and distal to the scapholunate joint and lies in the transverse plane. Visualization through this portal will delineate the articular surfaces of the triquetrum, hamate, capitate, lunate, scaphoid, trapezoid, and trapezium as well as the scapholunate and lunotriquetral ligaments. Given the flexibility and size of the NanoScope™ device, this portal will permit improved visualization of the scaphotrapezium/trapezoid (STT) joint.

■ Dorsal Triquetrohamate Midcarpal Portal

This portal lies between the triquetrum and hamate, ulnar to the ECU. The dorsal sensory branch of the ulnar nerve is at risk in creating this portal, which is often used as an outflow portal or to debride the triquetrohamate joint as needed.

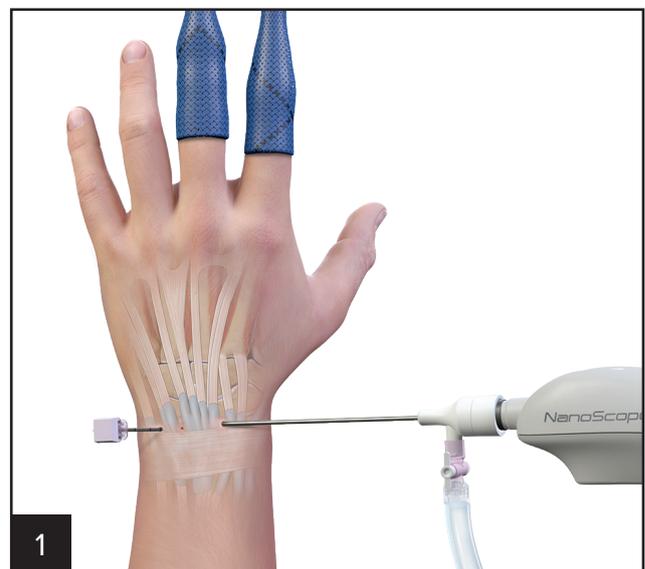
■ Dorsal STT Midcarpal Portal

This portal lies ulnar to the EPL tendon and in line with the radial border of the index finger metacarpal. It is bordered proximally by the scaphoid and distally by the trapezoid and trapezium. Structures at risk include the EPL and ECRL tendons, dorsal sensory nerves, and the radial artery. This portal is typically used for debridement of the STT joint.

Establishing Accessory Portals With the 2.7 mm NanoCannula and Insertion Kit

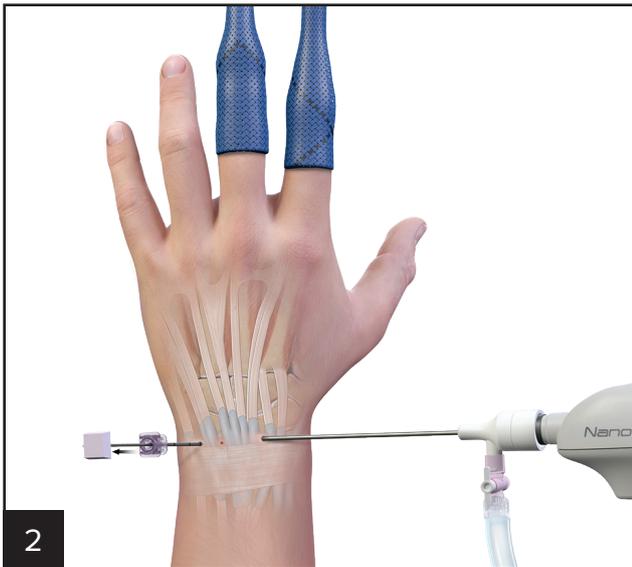
Additional working portals can be created to perform procedures using the technique above and working from a direction normal (perpendicular) to the pathology.

Initially, a portal should be created using the NanoScope disposable system. The surgeon has the option of performing dry (preferred) or wet wrist arthroscopy. For the latter, saline can be introduced (using the syringe included in the NanoScope disposable system) into the arthroscopic environment to directly visualize insertion of the NanoCannula using the Percutaneous Insertion Kit.

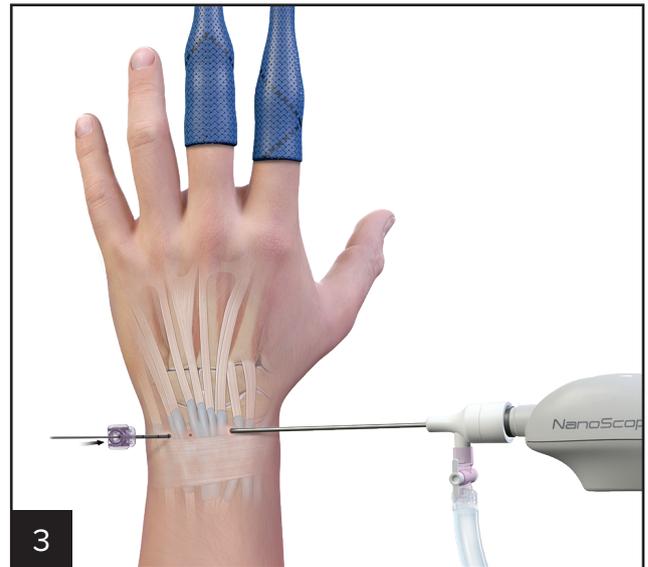


The Percutaneous Insertion Kit contains a spinal needle and a Nitinol guidewire. Insert the spinal needle through the skin to pinpoint an arthroscopy portal in the 4-5 or 6R portal. Use the depth markings on the spinal needle to determine the appropriate cannula length needed (the depth laser line markings are measured off the surface of the skin and correspond to the available cannula lengths).

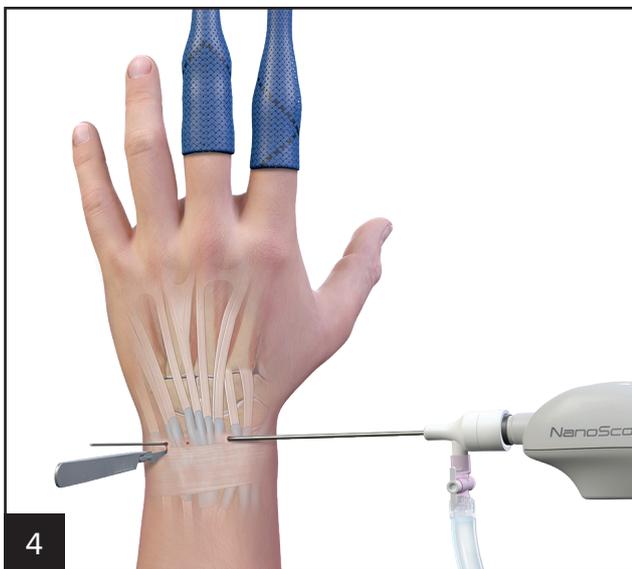
Establishing Accessory Portals With the 2.7 mm NanoCannula and Insertion Kit (Cont.)



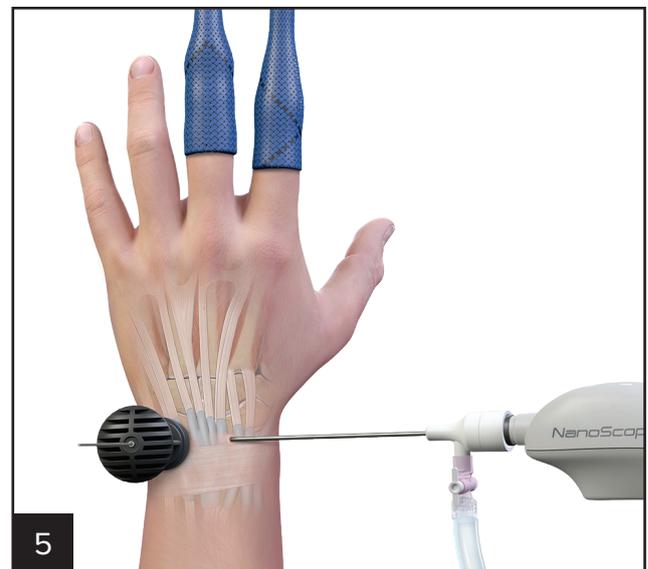
Remove the styllet from the needle.



Insert the Nitinol guidewire through the spinal needle. Remove the spinal needle, leaving the guidewire in place.

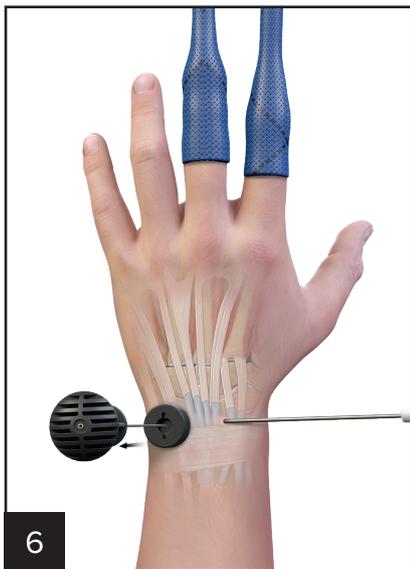


Before inserting the cannula, make a small skin incision at the base of the guidewire. **Note: the incision can be made prior to insertion of the spinal needle.**

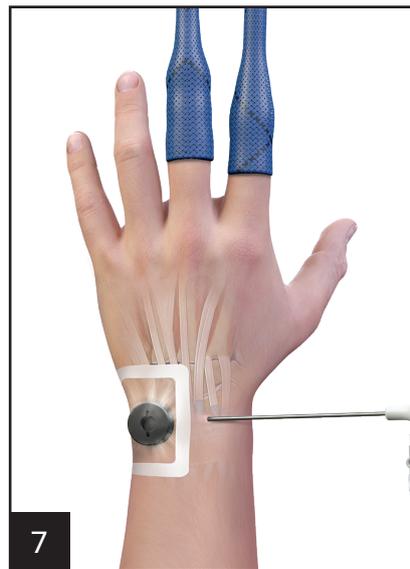


The NanoCannula comes with a cannulated obturator and an adhesive. Insert the obturator through the cannula, and then pass the obturator over the Nitinol guidewire from the percutaneous kit. Insert the NanoCannula into the joint space until the cannula head is flush to the skin.

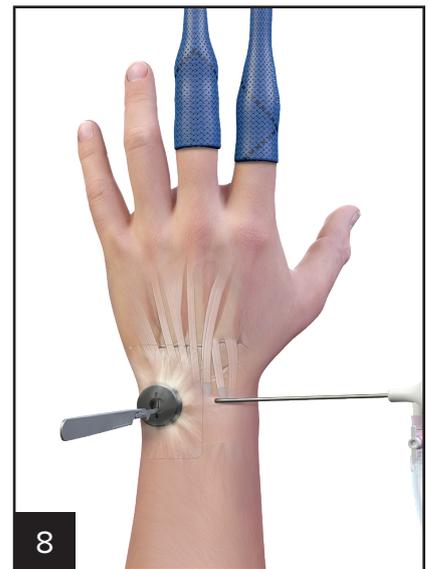
Establishing Accessory Portals With the 2.7 mm NanoCannula and Insertion Kit (Cont.)



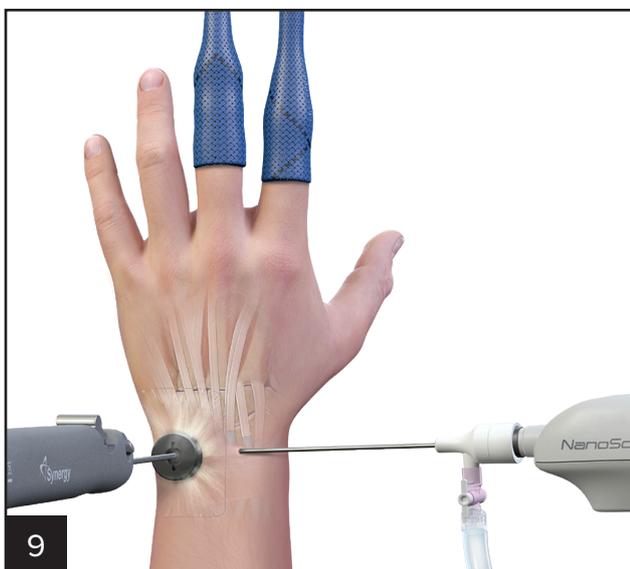
Remove the obturator and guidewire, leaving the cannula in place.



The adhesive included with the cannula is optional and aids in holding the cannula in place. If it used, apply the adhesive over the top of the NanoCannula and onto the surrounding dry skin. If the surrounding skin is wet, dry the area with a towel.



Once the adhesive is in place, use a small blade/scalpel to create a small slit in the adhesive located in the center of the cannula and no larger than the opening in the cannula. Take care not to overtighten the portal onto the skin to prevent pressure effects.



Once the working cannula is established, you can facilitate the Nano instrumentation and shaver through the cannula for arthroscopic treatment.

Post-procedure

After all of the structures have been thoroughly examined, remove the needle arthroscope from the joint and cover the needle site with surgical tape strips and a nonocclusive dressing.

- Clean the area around each viewing and working portal, removing all blood and fluids from the skin.
- The portals can be closed with suture or adhesive strips.
- Apply a bandage over the properly cleaned portals.

Ordering Information

Imaging System		
NanoScope™ Tablet Control Unit	13" HD Medical-Grade Imaging Console	AR-3200-0030
NanoScope Camera Head and Cable Kit, single-use	1 Camera, sterile packaged	AR-3210-0040
Mobile Carts		
Synergy MSK™ Ultrasound Cart	Mobile Cart	AR-3502-CRT
NanoScope Console Mount	MSK Cart NanoScope Conversion Kit	ATX-2601
Nano Arthroscopy 2 mm Instrumentation (130 mm Shaft Length)		
NanoBiter, straight	Disposable, sterile packaged, single pack	AR-10911D-1
NanoBiter, 15° Up	Disposable, sterile packaged, single pack	AR-10922D-1
NanoGrasper, straight	Disposable, sterile packaged, single pack	AR-10913D-1
NanoScissor, straight	Disposable, sterile packaged, single pack	AR-10915D-1
NanoProbe	Disposable, sterile packaged, single pack	AR-10100N
Nano Arthroscopy 2 mm Instrumentation (70 mm Shaft Length)		
NanoBiter, straight	Disposable, sterile packaged, single pack	AR-10911D-1
NanoBiter, 15° Up	Disposable, sterile packaged, single pack	AR-10902D-1
NanoGrasper, straight	Disposable, sterile packaged, single pack	AR-10903D-1
NanoScissor, straight	Disposable, sterile packaged, single pack	AR-10905D-1
Small Joint Probe	Reusable, single pack	AR-30000
Patient Prep Kit		
NanoScope Arthroscopy Prep Kit	Disposable, sterile packaged	74312-01M
Tissue and Fluid Outflow Cannula		
Outflow Cannula, Nano arthroscopy	Disposable, sterile packaged	AR-1090S-10
Outflow Cannula, Nano arthroscopy	Disposable, sterile packaged	AR-1090S-70
Fluid Management Tube Set Options		
Gravity Tube Set	Disposable, sterile packaged	AR-6412
Extension Tube Set	Disposable, sterile packaged	AR-6220
Nano Arthroscopy 2.7 mm Diameter NanoCannula and Insertion Kits		
2.7 mm Cannula and Cannulated Obturator, 1.5 cm length	Disposable, sterile packaged, single pack	AR-1090C-15-1
2.7 mm Cannula and Cannulated Obturator, 3 cm length	Disposable, sterile packaged, single pack	AR-1090C-30-1
2.7 mm Cannula and Cannulated Obturator, 4 cm length	Disposable, sterile packaged, single pack	AR-1090C-40-1
2.7 mm Cannula and Cannulated Obturator, 5 cm length	Disposable, sterile packaged, single pack	AR-1090C-50-1
2.7 mm Cannula and Cannulated Obturator, 7 cm length	Disposable, sterile packaged, single pack	AR-1090C-70-1
Nano Arthroscopy Percutaneous Insertion Kit	Disposable, sterile packaged, single pack	AR-1090PK-1



This description of technique is provided as an educational tool and clinical aid to assist properly licensed medical professionals in the usage of specific Arthrex products. As part of this professional usage, the medical professional must use their professional judgment in making any final determinations in product usage and technique. In doing so, the medical professional should rely on their own training and experience and should conduct a thorough review of pertinent medical literature and the product's directions for use. Postoperative management is patient specific and dependent on the treating professional's assessment. Individual results will vary and not all patients will experience the same postoperative activity level or outcomes.

Technique Guide created with the assistance of Sanj Kakar, MD.

View U.S. patent information at www.arthrex.com/corporate/virtual-patent-marking

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