Ankle and foot arthroscopy

Contemporary approach to diagnosis and treatment

A small joint technique guide as described by

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smith&nephew

Introduction

Ankle and foot injuries are frequently diagnosed by clinical and imaging examination. A number of ankle and foot disorders are either difficult to diagnose or their clinical significance may be difficult to evaluate by traditional methods. Ankle and foot injuries can result from excessive loading, either as an isolated event (most often a soft tissue injury as the consequence of stress to the inverted foot while in plantar flexion), or as a series of events that produce overuse or fatigue failure. Cartilage and soft tissue injuries associated with recurrent effusion, nonspecific tenderness, restricted motion, or a feeling of instability can present a diagnostic challenge.

On the other hand, chondral fractures and osteochondral lesions of the talus, tibia, and calcaneus can be more easily identified radiographically, but the extent of articular surface damage may not be readily ascertained. Clinical experience have shown that these types of ankle and foot pathologies may be diagnosed and, in many cases, effectively treated, arthroscopically.

Given the challenges described and the introduction of a broad range of arthroscopic instruments and techniques, ankle and foot arthroscopy has become increasingly popular as a means to diagnose and treat various disorders.

Patient selection

Diagnostic arthroscopy is indicated in patients whose ankle and foot problems include unexplained pain, swelling, stiffness, instability, hemarthrosis, or locking. Therapeutic ankle and foot arthroscopy is indicated for articular injury, soft tissue and bony impingement, arthrofibrosis, some types of fractures and nonunions, synovitis, loose bodies, osteophytes, chondromalacia, osteochondral lesions of articular surfaces, and osteoarthritis. An arthroscopic approach may also be used for ankle and subtalar stabilization, peroneal and posterior tibial endoscopy, hindfoot pathology, and visualization of almost all foot and ankle joints.

Patient preparation and positioning

General, spinal, epidural, or, in some cases, local anesthesia may be used. In most cases, anesthesia can also be supplemented with a popliteal block.

Place the patient in the supine position with a lateral post supporting the buttock on the operative side, and a Ferkel Thigh Holder to help stabilize the thigh and flex the hip and knee. Use a Guhl Non-Invasive Ankle Distractor to distract the ankle (**Figure 1**).

This positioning provides several advantages: it facilitates hip, knee, ankle, and foot positioning, permits the surgeon to sit or stand during the procedure, and provides ready access to anterior and posterior portals. As always, surgeon preference and procedure specifics will govern patient positioning.

Place a tourniquet on the thigh. Secure the thigh on the thigh holder and flex the knee to approximately 60°. After positioning the thigh, remove the pad from the foot of the bed to provide more working room posteriorly. Complete the setup with standard sterile preparation and draping. The tourniquet may be inflated, although its use is optional unless viewing is obscured.

At the surgeon's discretion, distraction to increase the space between tibia and talus, or talus and calcaneus, may then be applied as an optional step (Dr. Ferkel uses distraction in every case). Distraction may be applied by various methods and may be increased after the initial application, as capsular tissue elasticity allows. Joint distraction with a sterile, non-invasive device, utilizing a disposable strap is preferred (**Figure 1**). This technique is safe for up to one hour before relaxing the distraction one click.

Distraction helps prevent injury to the articular surfaces and aids in visualization, particularly in difficult-to-see areas as the central tibial plafond and talar dome. Ankle and foot joint distraction, as well as transmalleolar approaches to the joint (sometimes used for operative techniques), are contraindicated in cases of reflex sympathetic dystrophy, open epiphyses, pyarthrosis, chronic infection, and may not be needed in ankle and foot joints that appear to have generalized ligamentous laxity.

Figure 1. Lateral view of the proper positioning for ankle arthroscopy using a non-sterile Ferkel Thigh Holder and a sterile, Guhl Non-Invasive Ankle Distractor

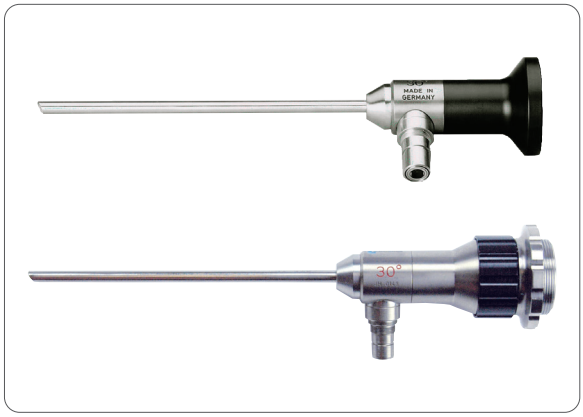

Figure 2. 4mm and 2.7mm, 30° and 70° VideoArthroscopes can be utilized for ankle and foot arthroscopy

Figure 3. DYONICS® POWERMINI® Small Joint Shaver used for ankle and foot arthroscopy

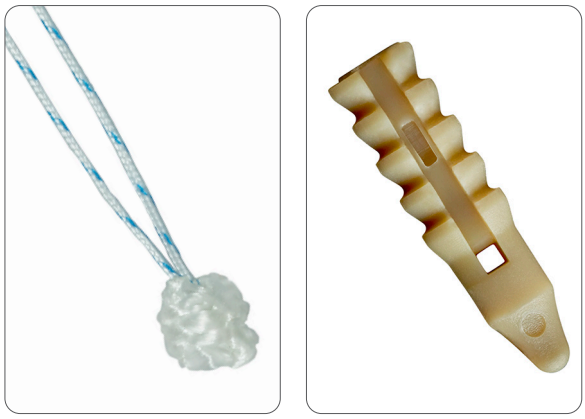

Figure 4. Smith+Nephew 1.8mm Q-FIX® Mini or 3.0mm RAPTORMITE® Suture Anchors are used for soft tissue fixation

Instrumentation

New, shorter VideoArthroscopes, 100mm (4.0mm) or 65mm (2.7mm) in length, decrease the lever arm effect while still providing a large field of vision with good clarity. VideoArthroscopes (**Figure 2**) should have a 30° or 70° oblique viewing angle and either a 4mm or 2.7mm diameter, depending upon the pathology to be examined and the space available in the ankle and foot.

Smaller diameter instruments are preferred in almost all cases due to the limited working space in the foot and ankle joints. Operative techniques are facilitated by the use of a variety of small joint instruments that now include power shavers (**Figure 3**), burrs and abraders, knives, suction punches, curettes, and other devices. Anchors are designed for and used in demanding procedures; they can provide superior holding strength in small areas that require soft tissue fixation. (**Figure 4**)

Key factors in performing successful ankle arthroscopy are use of a high volume fluid flow system (**Figure 5**) with a 3-liter bag that maintains constant distension, and accompanying outflow capability through the arthroscope or an accessory portal. An infusion pump can also be used to maintain ankle distension, but great care should be taken to ensure safe usage.

Figure 5. 2.1mm and 2.9mm operative cannula sets with “inflow adapters” for use with 1.9mm and 2.7mm arthroscopes

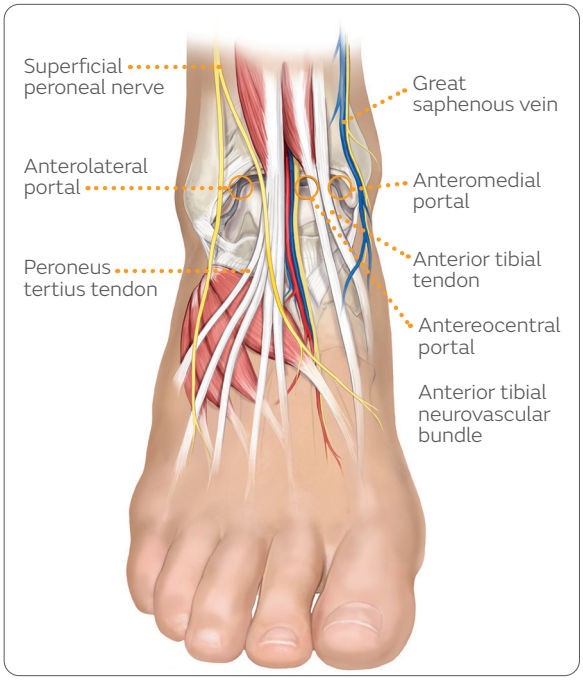

Figure 6. Recommended anterior portals

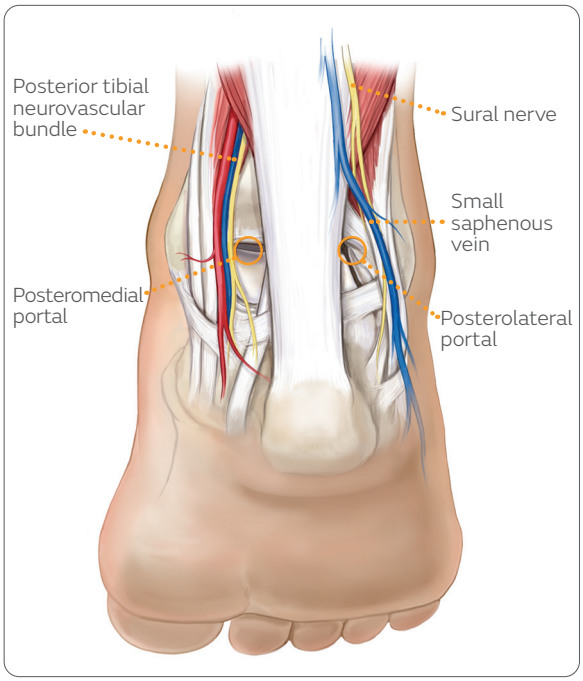

Figure 7. Recommended posterior portals

Anatomy and portal locations

In order to provide complete access to the joint, as well as flexibility of approach during examination and surgery, three portals are routinely established, the anterolateral, the anteromedial, and the posterolateral. To avoid injury, portal placement must be based on a thorough understanding of the ankle and foot extra-articular anatomy. The risk of injury to neurovascular structures is the greatest concern, but it is also important to avoid damaging the tendons that traverse the joint.

Identify and outline the key anterior landmarks – dorsalis pedis artery, saphenous vein and anterior tibial, peroneus tertius, extensor digitorum communis, and Achilles tendons. Marking the superficial peroneal nerve branches is particularly important; this is done with the foot held in plantar flexion and inversion. At least one branch of the superficial peroneal nerve can be easily identified, except in some patients who have large amounts of adipose tissue. Use palpation during dorsiflexion and plantar flexion of the foot and ankle to locate the anterior joint line.

The recommended anterior portals (**Figure 6**) show key ankle structures and three possible anterior portal sites. Since the anterocentral portal requires extraordinary care to avoid damaging the dorsalis pedis artery and the deep branch of the peroneal nerve, it is not recommended. Identify and mark the portal sites. The recommended anterior portals are the anteromedial portal, just medial to the anterior tibial tendon and parallel to the joint line, and the anterolateral portal, just lateral to the peroneus tertius tendon and parallel to the joint line. The lateral portal varies depending on the location of the pathology.

Identify and mark the posterior landmarks and portals (**Figure 7**). Posterior portals are also used in ankle arthroscopy. The recommended portals are the posterolateral portal, just lateral to the Achilles tendon and about one-half inch (1.2cm) proximal to the distal tip of the lateral malleolus, and the posteromedial portal, in a similar location, using the posterolateral portal and cannula for orientation.

As shown in Figure 7, the posterior portals may be established medial or lateral to the Achilles tendon or a trans-Achilles puncture can be made just below the joint line. Only the posterolateral portal is recommended for standard arthroscopic procedures to minimize the risk of injury to the neurovascular structures.

The posteromedial portal is more commonly used for posterior hindfoot arthroscopy, and should be made with great caution. Sometimes hindfoot arthroscopy is done in the prone position to make access to the posterolateral and posteromedial portals easier. The posterolateral portal is more frequently used than the posteromedial portal in the supine position. The trans-Achilles portal is not recommended.

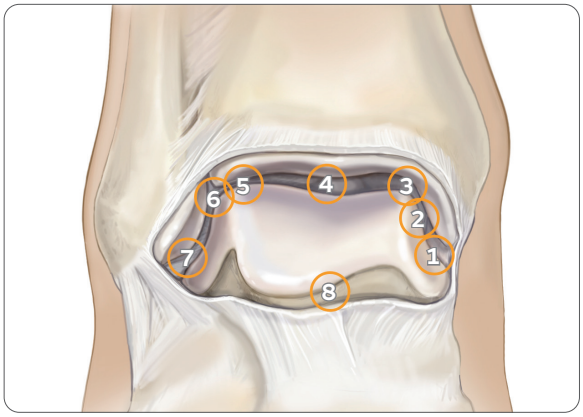

Figure 8. Arthroscopic appearance of the eight anterior points for methodical arthroscopic examination, showing the relationship of these portals to underlying tissues

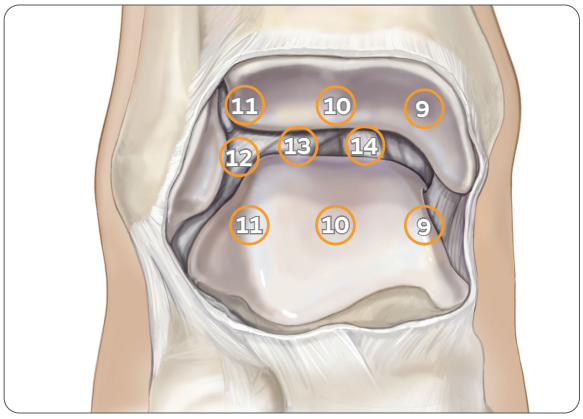

Figure 9. Arthroscopic appearance of the six central and posterior ankle examination points, as seen from the anteromedial portal

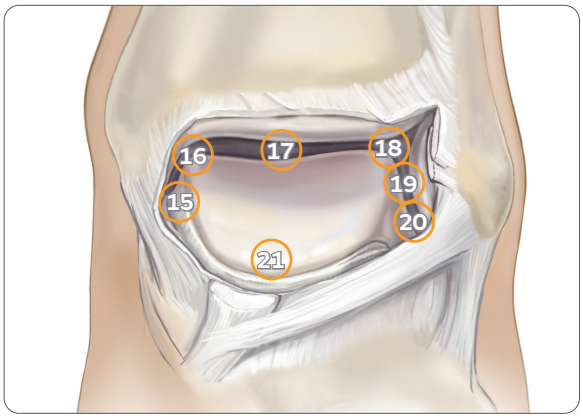

Figure 10. Arthroscopic appearance of the seven posterior examination points and underlying tissue at each portal

1. Deltoid ligament **2.** Medial gutter **3.** Medial talus **4.** Central talus **5.** Lateral talus **6.** Talofibular articulation **7.** Lateral gutter **8.** Anterior gutter **9.** Medial talus **10.** Central talus **11.** Lateral talus **12.** Posterior tibiofibular ligament **13.** Transverse tibiofibular ligament **14.** Capsular reflection of the flexor hallucis longus **15.** Medial gutter **16.** Medial talus **17.** Central talus **18.** Lateral talus **19.** Talofibular articulation **20.** Lateral gutter **21.** Posterior gutter

Portal establishment

Establish the anteromedial portal first. Use a 22 gauge needle to infuse 10cc of sterile saline solution at the marked portal to distend the joint. Use a #11 scalpel blade to make a skin incision while palpating the anterior tibial tendon with the opposite index finger. Use a small clamp to open the incision to the capsule. Insert an arthroscopic cannula taking care to avoid injury to the saphenous vein and nerve. Infuse additional fluid through the cannula and visualize the joint.

Under direct visualization, to avoid injuring the branches of the superficial peroneal nerve, use a 22 gauge needle to establish the anterolateral portal. Depending on the pathology, place the portal more medial or lateral. Incise the skin and carefully spread the soft tissues, then insert the cannula. The anterolateral portal is initially used for inflow, then subsequently, instrumentation.

Use an 18 gauge, 3-inch spinal needle to establish the posterolateral portal in a similar fashion. Visualize the position of the needle arthroscopically through the anteromedial portal as it punctures the posterior capsule. Insert the cannula with care to avoid injury to sural nerve branches and the short saphenous vein. The posterolateral portal is used initially as the primary inflow portal, and can subsequently be used for visualization or instrumentation through the interchangeable cannulas of the arthroscopic system used.

Accessory portals may be established, under direct vision and using the same basic technique, as needed for better visualization of selected areas or for certain operative techniques, such as insertion of K-wires, loose body removal and ligament reconstruction.

Examination of the joint

Successful arthroscopic examination of the ankle, like that of the knee or shoulder, requires a methodical approach. With such an approach, the surgeon can be confident that all pathology is visualized, that the method is accurate and reproducible from one patient to another, and that a complete digital record is available for later study. Dr. Ferkel has developed a 21-point examination system (**Figures 8, 9 and 10**).

Visualization of these points can generally be accomplished using the three basic portals. The typical arthroscopic maneuvers employed in large joint examinations, i.e., scanning with a sweeping motion, a forward and back pistoning of the arthroscope within the joint, and rotating the device around its axis are also employed in examining the ankle joint.

The central portion of the talus is examined thoroughly on the tibia and the talus through the anterior and posterior portals. In addition, the anterior articular portion of the posterior capsuloligamentous structures are also visualized through the anterior portals. These include the posterior tibiofibular ligament, the transverse tibiofibular ligament, and the capsular reflection of the flexor hallucis longus (**Figure 9**).

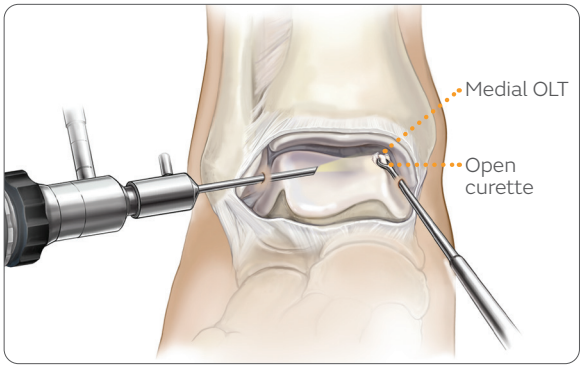

Figure 11. Excision of the medial osteochondral lesion of the talus is accomplished through the anteromedial portal while viewing through the anterolateral portal

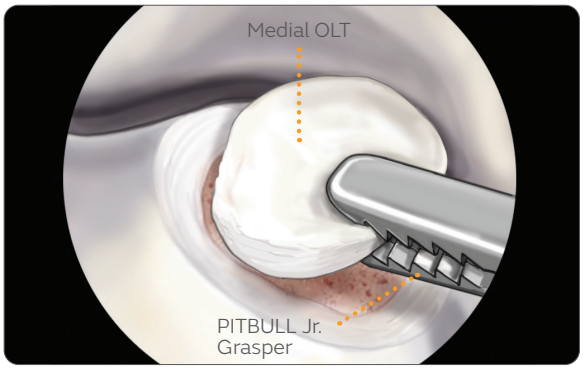

Figure 12. Extraction of the osteochondral lesion of the talus is performed using a PITBULL Jr. Grasper

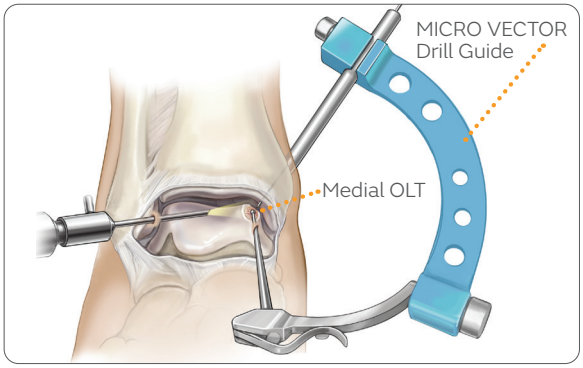

Figure 13. Transmalleolar drilling of the osteochondral lesion of the talus through the medial malleolus while viewing through the anterolateral portal

Figure 14. Close-up of K-wire entering the talar lesion via transmalleolar drilling

Ankle pathology

Osteochondral (OLT), arthritic, and soft tissue pathologies in the ankle can be visualized during the arthroscopic examination and many can be treated, usually without the need for additional open exposure or dissection. Biopsy, debridement, synovectomy, and loose body removal procedures can be performed on articular cartilage, bone, synovium, or ligaments (**Figures 11 and 12**).

During the arthroscopic examination, the surgeon can identify and treat osteochondral and chondral lesions of the talus and tibia. Selected acute fractures can be reduced and arthroscopically fixated with percutaneous pinning. Post-fracture defects and arthrofibrosis can be assessed and treated arthroscopically.

The ability to diagnose osteochondral lesions of the talar dome promptly, treat the condition immediately with a relatively non-invasive procedure, and permit early joint motion and patient rehabilitation are good examples of the advantages offered by ankle arthroscopy. In the past, such lesions were often associated with delayed diagnosis while significant morbidity and prolonged rehabilitation could be anticipated when arthrotomy was undertaken.

Debridement, curettage, and drilling with the MICRO VECTOR Aiming Device via transmalleolar, transtalar, or percutaneous means (under direct and/or fluoroscopic control) to stimulate a new blood supply and healing, can be performed through the arthroscope for surgical treatment of osteochondral lesions of the talus (and tibia) as illustrated (**Figures 11–16**). Currently small diameter microfracture picks and drills are utilized alone or together to treat osteochondral lesions of the talus (**Figures 13–16**).

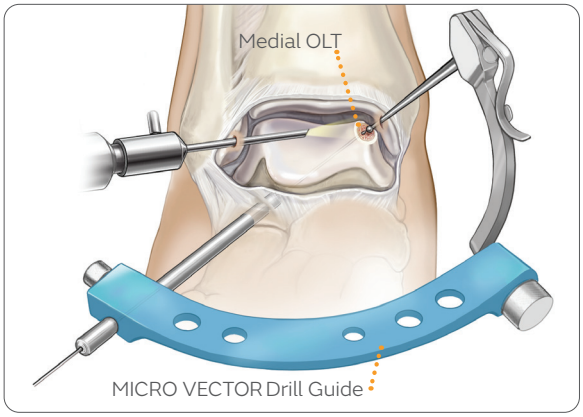

Figure 15. Transtalar drilling of an osteochondral lesion of the medial talar dome, utilizing the MICRO VECTOR Aiming Device

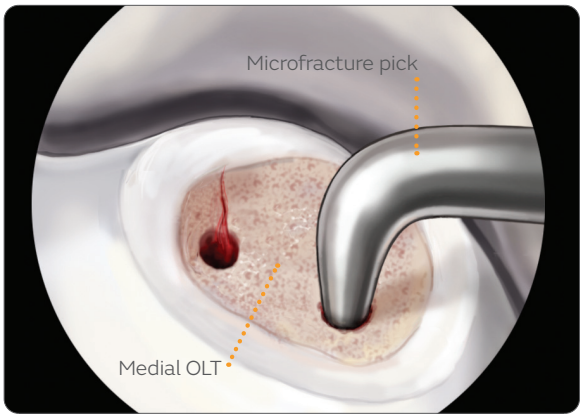

Figure 16. Insertion of 90° microfracture pick 3 to 4mm deep into the osteochondral lesion to facilitate bleeding and formation of new fibrocartilage

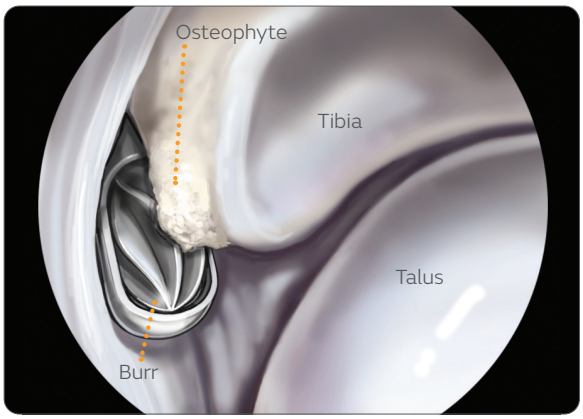

Figure 17. Excision of osteophyte of the anterior distal tibia, utilizing a burr. Visualization is from the anteromedial portal and the burr is inserted through the anterolateral portal

Arthritic conditions, including loose bodies and osteophytes, are other ankle disorders that can be visualized and treated arthroscopically. Removal of loose bodies is accomplished using probes, graspers, and suction apparatus. Osteophytes that produce pain and cause a loss of motion are amenable to arthroscopic intervention. Excess synovial and scar tissue is removed first, with a shaver, to optimize visualization. The osteophytes can then be removed with a burr, osteotome, or by grasping with a pituitary rongeur (**Figure 17**).

Soft tissue pathologies that can be observed and treated arthroscopically include a wide range of synovial disorders (for example, inflammatory conditions such as rheumatoid arthritis), as well as infections, impingement, and post-fracture defects.

Inversion injuries to the ankle can lead to soft tissue impingement that can cause chronic ankle pain. This soft tissue impingement can be present anterolaterally, posterolaterally, medially or at the anterior syndesmotic area, or can occur simultaneously in both the lateral and medial portions of the ankle.

Soft tissue impingement is most commonly seen in the anterolateral gutter. Torn ligaments, anterior talofibular, calcaneofibular, and anterior tibiofibular, heal with scar tissue and are then subjected to the repetitive movements of the ankle, which can develop synovitis or scar tissue that becomes trapped between the adjacent bony structures. In many patients, radiographic studies, including stress x-rays, do not demonstrate this type of pathology. MRI, however, has been helpful in showing areas of scar tissue formation that seem to be consistent with the soft tissue impingement lesion.

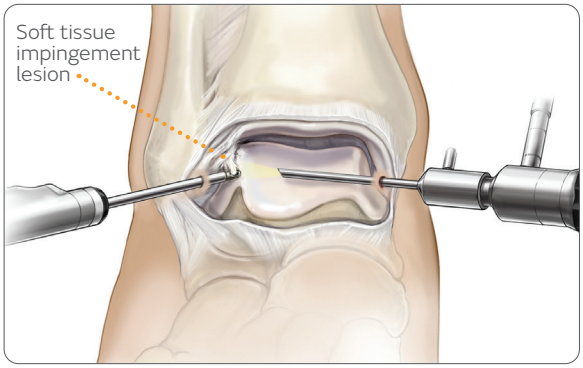

Figure 18. Viewed through the anteromedial portal, anterolateral soft tissue impingement with synovitis and fibrosis at the anterolateral gutter.

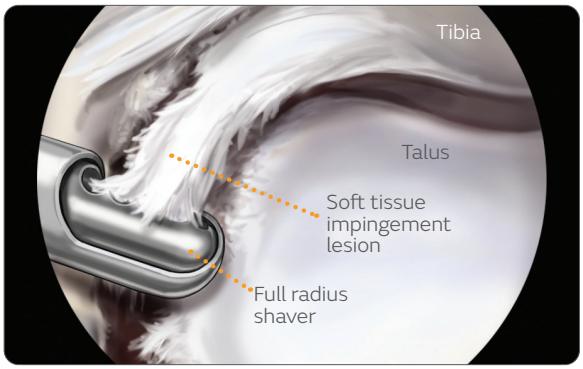

Figure 19. A 2.9mm full-radius shaver is inserted through the anterolateral portal for synovectomy and debridement

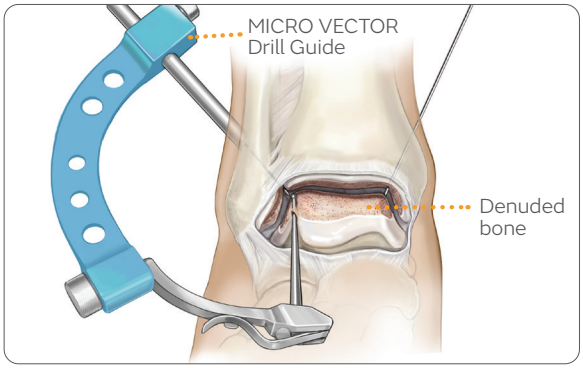

Figure 20. Guide pin placement for arthroscopic arthrodesis

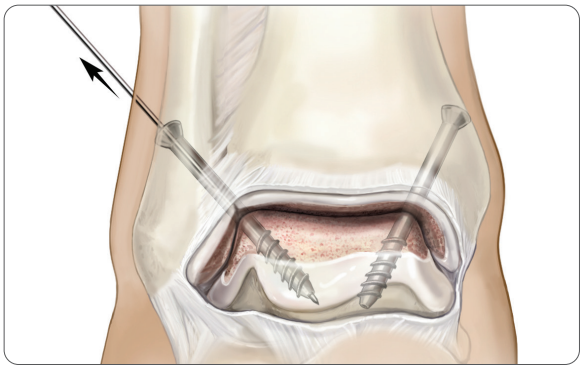

Figure 21. Cannulated screw placement for arthroscopic arthrodesis

With arthroscopy, inflamed synovium, scar and adhesion tissue, osteophytes and loose bodies can be visualized and treated using a power shaver, burr, and a suction punch. Care must be taken to avoid excision of the ATFL (**Figures 18 and 19**).

Symptomatic post-fracture defects that involve chondromalacia, osteophytes, impingement, scarring, synovitis, and loose bodies can be similarly corrected arthroscopically. Arthroscopic arthrodesis has been shown to be an effective method of treatment for the severely arthritic ankle.

Use the MICRO VECTOR drill guide to insert a guide pin for a large cannulated screw. Angle the guide pins appropriately in the coronal and sagittal planes to get maximum compression (**Figure 20**).

After verifying the correct position of the guide pins through the medial and lateral malleoli, place the ankle in the appropriate position and advance the guide pins into the talus. Insert the appropriate length cannulated screws over the guide pins to provide secure fixation while the ankle fusion is occurring (**Figure 21**).

Postoperative management

Following arthroscopy of the ankle, portal wounds are closed with 4-0 non-absorbable suture, and a sterile compression dressing is applied. A short leg splint is then applied. Elevation of the leg and ice packs are recommended, as necessary. Patient surgery is done as an outpatient and they are non-weight bearing on crutches.

Dressings are usually removed 5 to 7 days postoperatively, and a compression stocking and brace applied. The patient is given instructions for home exercises at this point. The amount of weight bearing is adjusted, depending on the pathology. Formal physical therapy is initiated 3 to 4 weeks postoperatively, depending on the pathology. Normal activities, including athletic activities, can usually be resumed within 6 to 12 weeks after surgery, depending on the surgical procedure and the speed of recovery. Healing will be longer with some procedures, such as arthroscopic drilling or microfracture of the talus or ankle arthrodesis.

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Ordering information

Manual Instruments	
Reference #	Description
72203782	Instrument Tray* **Note:** Instruments can be ordered a la carte**
Microfracture Curved Picks	
72203661	90° Curved Pick
72203662	65° Curved Pick
72203663	45° Curved Pick
72203781	Pick Assist
Microfracture Straight Picks	
72203678	90° Pick
72203679	65° Pick
72203680	40° Pick
Curettes	
72203682	30° Open Curette 2.5mm
72203683	15° Open Curette 2.5mm
72203686	15° Closed Curette 3mm
72203681	15° Open Curette 4mm
72203780	15° Open Curette 6mm
Curettes (Anterior Lesion)	
72203666	90° Curved Curette
72203684	90° Curette
Osteotomes	
72203687	15° Osteotome 3mm
72203688	Straight Osteotome 4mm
72203689	20° Osteotome 4mm
Elevators	
72203665	Teardrop Curved Elevator
72203703	Curved Elevator
Probes	
72203691	Curved Probe 3mm
72203692	Probe 3mm
72203670	Probe 2mm
3312	Probe

*Tray allows room for 14 manual instruments, 10 handheld instruments (e.g. punches, graspers, etc.), a MICRO VECTOR System and a limited number of cannulas and obturators

**Select 14 of your favorite manual instruments (microfracture picks, curettes, osteotomes, elevators and probes) and 10 handheld instruments(punches and graspers).

MICRO VECTOR Drill Guide System	
4314	MICRO VECTOR Drill Guide System
Handheld Instruments	
014843	RAPTOR◊ Jr. Punch
014844	Blunt Nose Jr. Punch
014845	PITBULL◊ Jr. Grasper
013219	Small Joint Grasper
3499	DYOVAC◊ Straight Suction Punch, 2.5 mm
7207598	MicroGraspers, straight
7207599	MicroGraspers, Up 10°
7207600	MicroPunch, straight
7207601	Teardrop punch, right
7207602	Teardrop punch, left
DYONICS◊ POWERMINI◊	
72201500	DYONICS POWERMINI Small Joint Handpiece with blade multi-positioning (with hand controls)
72201503	DYONICS POWERMINI Small Joint Handpiece with Blade Multi-Positioning (without hand controls)
Operative and Inflow Cannulas	
Cannulas for use with 1.9mm Arthroscopes	
72201849	2.2mm Rotatable Cannula, double-valve, short
72201197	Obturator, Conical Tip for 2.2mm Rotatable Cannulas, short length
Cannulas for use with 2.7mm Arthroscopes	
72201751	Cannula double valve rotatable, 2.9mm
72201752	Obturator 2.9mm for 72201751
210715	3.8mm short cannula, high flow
4527	Obturator for 3.8mm cannula
Other cannula options:	
3672	2.9mm Short Cannula with finger post
3781	2.9mm Short Cannula with flow port
3807	2.9mm Short Obturator, conical tip
3786	2.9mm Short Obturator, blunt tip
72203624	2.9mm Rotatable Cannula, double-valve, standard length
72203625	2.9mm Obturator, conical tip
4308	3.6mm Operative Cannula, single valve, fixed
4310	3.6mm Obturator, conical tip
7205999	4.6mm Standard Cannula, high flow, double valve
4439	4.6mm Obturator, conical tip

Ordering information

Blades and Burrs	
72201504	TURBOWHISKER blade, 2.0mm
72201505	TURBOWHISKER blade, 2.9mm
72201506	CUTTER blade, 2.9mm
72201507	FULL RADIUS blade, 2.0mm
72201509	FULL RADIUS blade, 2.9mm
72201510	FULL RADIUS blade, 3.5mm
72201512	RAZORCUT blade, 3.5mm
72201513	INCISOR◊ PLUS ELITE blade, 2.9mm
72201514	INCISOR PLUS ELITE blade, 3.5mm
6900927	BONECUTTER◊ blade, 3.5mm
72201518	ABRADER burr, 2.9mm
72201519	ABRADER burr, 3.5mm
72201520	BARREL burr, 2.9mm
High-Definition Compatible VideoArthroscopes	
Non-Autoclavable	
4130	2.7mm outer diameter, 30° direction of view (120mm)
4131	2.7mm outer diameter, 30° direction of view (67mm)
4132	2.7mm outer diameter, 70° direction of view (70mm)
7208133	1.9mm outher diameter, 30° direction of view
Direct-View, Autoclavable	
7205682	2.7mm outer diameter, 30° direction of view (67mm)
7205681	2.7mm outer diameter, 30° direction of view (119mm)
Ankle Distractor and Thigh Holder	
72201812	Ferkel Thigh Holder, includes 1 foam pad
72201813	Foam pad (box of 1)
72201814	Foam pads (box of 5)
72070709	Guhl non-invasive ankle distractor
014407	Ankle distractor foot straps, disposable
013227	Table clamp
New Small Joint Suture Anchors	
72201805	RAPTORMITE 3.7 PLLA Suture Anchor with Needles
72201806	RAPTORMITE◊ 3.0 PK Suture Anchor with Needles
72202038	3.2mm DRILL KIT for use with RAPTORMITE 3.7 PLLA Suture Anchor
72202039	2.6mm Drill & Guide, RAPTORMITE 3.0
72290123	1.8mm Q-FIX MINI All-Suture Anchor
72290125	1.8mm Q-FIX MINI Disposable Kit
72205451	**ULTRABRACE◊ Augmentation**
System includes:	
72203981	HEALICOIL◊ PK 4.5mm Suture Anchor with one ULTRATAPE Suture (Blue)
72203783	FOOTPRINT◊ Ultra PK Suture Anchor, 4.5mm, SL
72201407	Suture Passer, 2" Sterile
72203785	4.0mm Drill for 4.5mm FOOTPRINT Anchor, SL
72205449	**Q-FIX Broström**
System includes:	
72290123	1.8mm Q-FIX◊ MINI All-Suture Anchor
72290125	1.8mm Q-FIX MINI Disposable Kit
72205450	**RAPTORMITE Broström**
System includes:	
72201806	RAPTORMITE 3.0 PK W/Ndl, 2 #0 ULTRABRAID◊
72202039	2.6mm Drill & Guide, RAPTORMITE 3.0
72202039	2.6mm DRILL KIT for use with RAPTORMITE 3.0 PK
72202038	3.2mm DRILL KIT for use with RAPTORMITE 3.7 PLLA Suture Anchor

Additional instruction

To order the instruments used in this technique, call **+1 800 343 5717** in the U.S. or contact an authorized Smith+Nephew representative. Prior to performing this technique, consult the Instructions for Use documentation provided with individual components – including indications, contraindications, warnings, cautions and instructions.

Caution: U.S. Federal law restricts these devices to sale by or on the order of a physician.

Learn more at **smith-nephew.com**

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