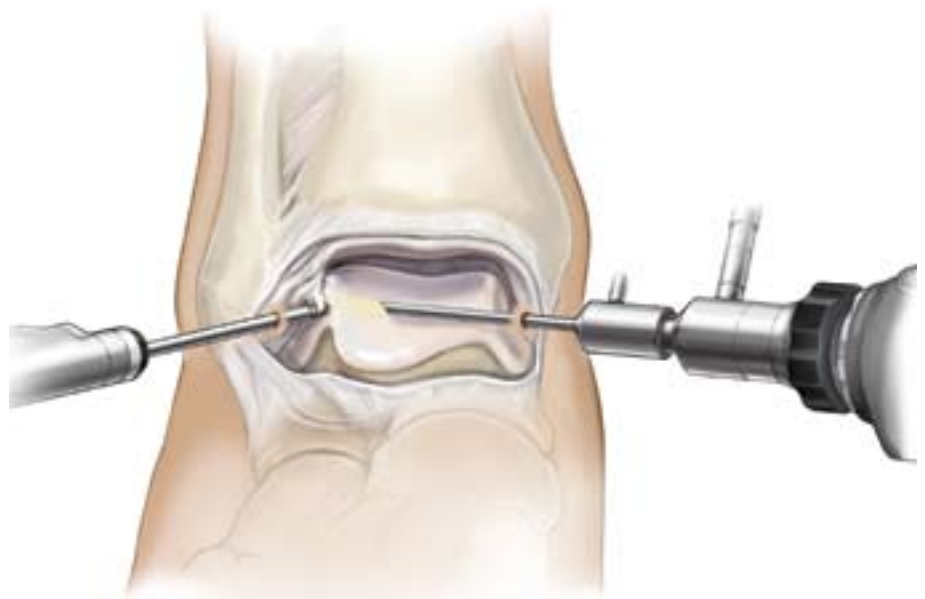


Ankle and Foot Arthroscopy

Contemporary Approach to
Diagnosis and Treatment

A Small Joint Series Technique Guide described by:
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As described by:

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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. Recent studies and 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 above 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 arthrodesis. An arthroscopic approach may also be used on occasion for ankle and subtalar stabilization, peroneal and posterior tibial tendoscopy, hindfoot pathology, and visualization of almost all foot and ankle joints.



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.

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, 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 on the front 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 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.

Instrumentation

New, shorter VideoArthroscopes, 100 mm 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 4 mm or 2.7 mm 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 because of 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 2. 4 and 2.7 mm 30° and 70° arthroscopes can be utilized for ankle and foot arthroscopy.



Figure 3. POWERMINI* small joint shaver used for ankle and foot arthroscopy.



Figure 4. Smith & Nephew TWINFIX* Ti 2.8 HS Suture Anchor used for soft tissue fixation.



Figure 5. 2.2 mm Operative Cannula set and small joint instrumentation used with the 2.7 mm small joint arthroscope.

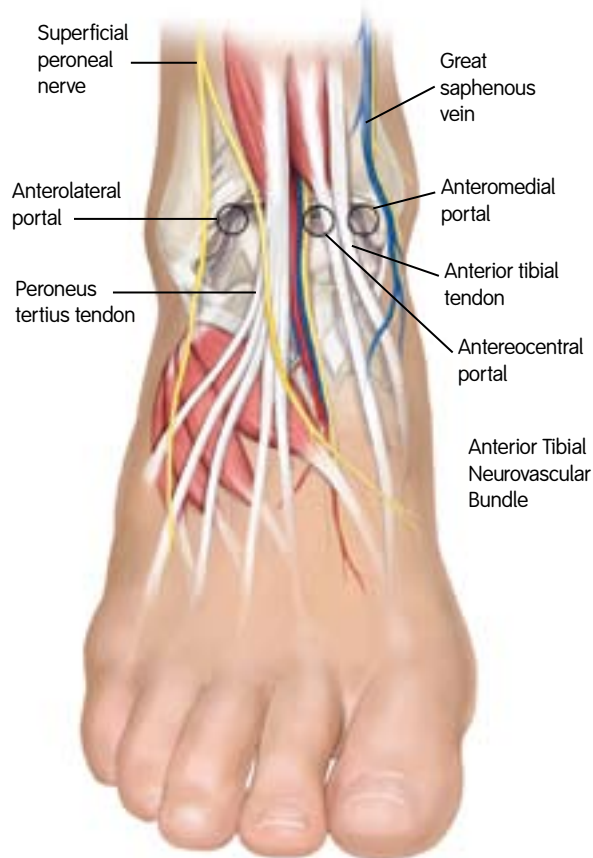


Figure 6. Recommended anterior portals.

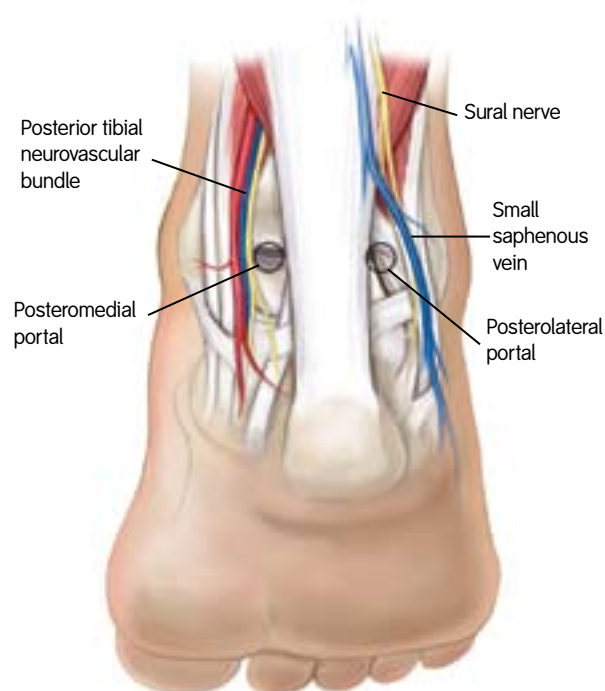


Figure 7. Recommended posterior portals.

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 antero-central 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 (1.2 cm) 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.

Recently the posteromedial portal has become more popular 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. The trans-Achilles portal is not recommended.

Portal Establishment

Establish the anteromedial portal first. Use a 22 gauge needle to infuse 10 cc of sterile lactated Ringer's 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 VideoArthroscope 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 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 or loose body removal.

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, shown in **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 inferior tibiofibular ligament, the transverse tibiofibular ligament, and the capsular reflection of the flexor hallucis longus (**Figure 9**).

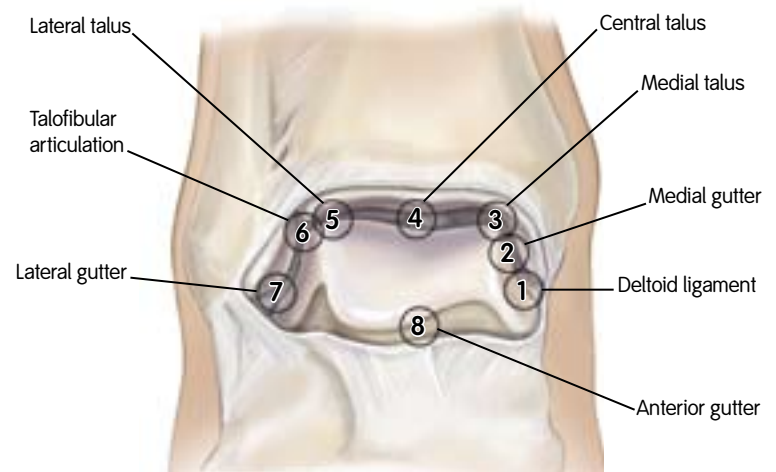


Figure 8. Arthroscopic appearance of the eight anterior points for methodical arthroscopic examination, showing the relationship of these portals to underlying tissues.

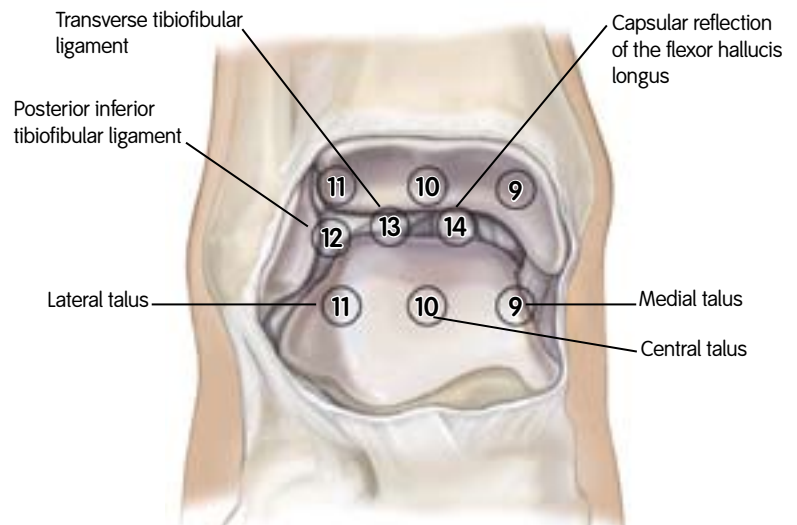


Figure 9. Arthroscopic appearance of the six central and posterior ankle examination points, as seen from the anteromedial portal.

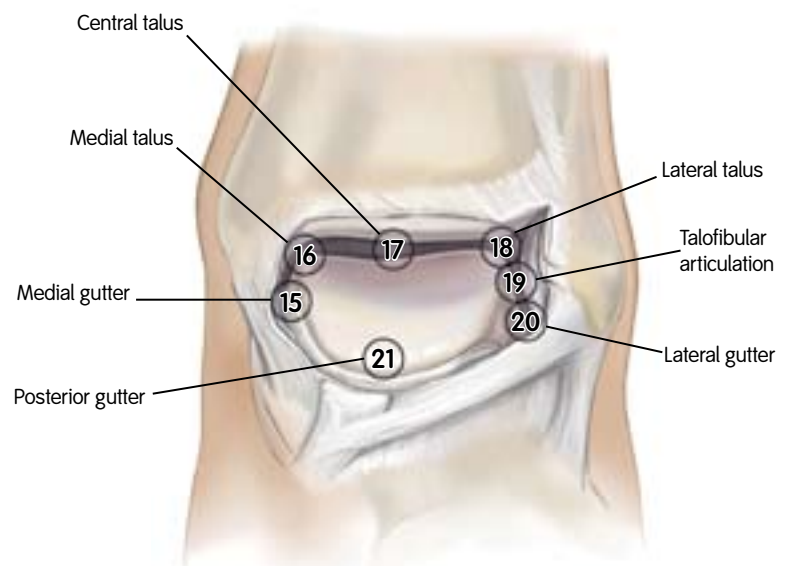


Figure 10. Arthroscopic appearance of the seven posterior examination points and underlying tissue at each portal.

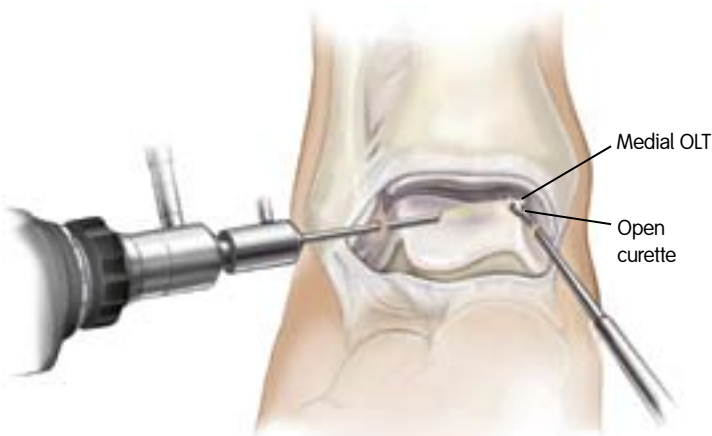


Figure 11. Excision of the medial osteochondral lesion of the talus is accomplished through the anteromedial portal while viewing through the anterolateral portal.

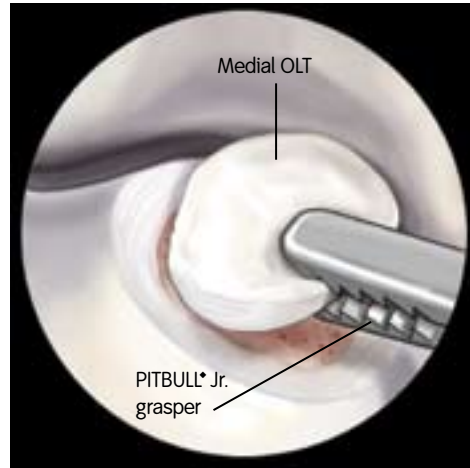


Figure 12. Extraction of the osteochondral lesion of the talus is performed using a PITBULL® Jr. grasper.

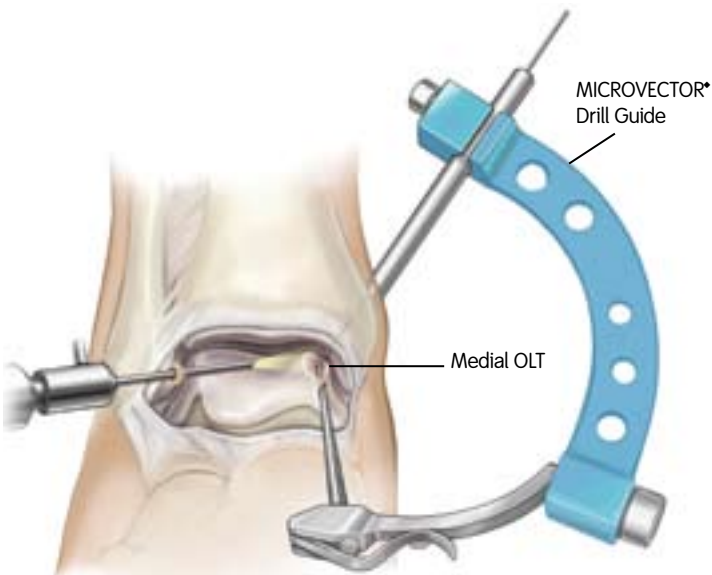


Figure 13. Transsalleolar drilling of the osteochondral lesion of the talus through the medial malleolus while viewing through the anterolateral portal.

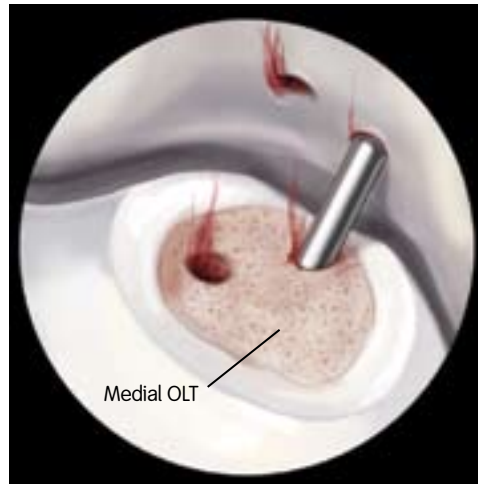


Figure 14. Close-up of K-wire entering the talar lesion.

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 MICROVECTOR® aiming device via transsalleolar, 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 in Figures 11–16. Currently microfracture is utilized alone or in conjunction with drilling (Figures 13–16).

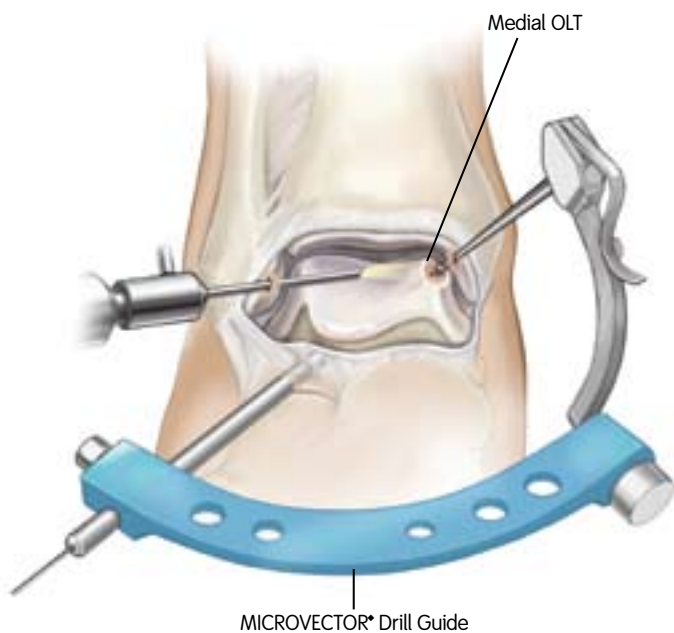


Figure 15. Transtalar drilling of an osteochondral lesion of the medial talar dome, utilizing the MICROVECTOR® aiming device.

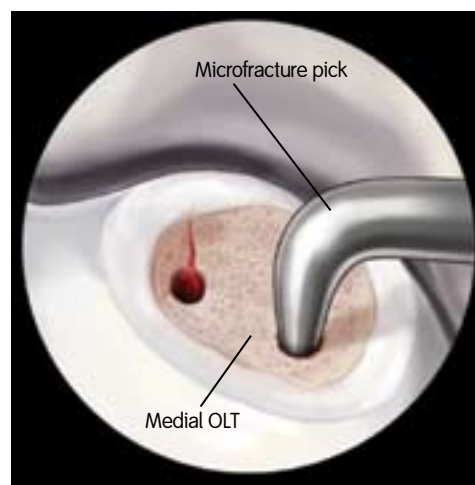


Figure 16. Insertion of 90° microfracture pick 3 to 4 mm deep into the osteochondral lesion to facilitate bleeding and formation of new fibrocartilage.



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 talo-fibular, calcaneal-fibular and anterior inferior tibiofibular, heal with scar 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 impingement lesion.

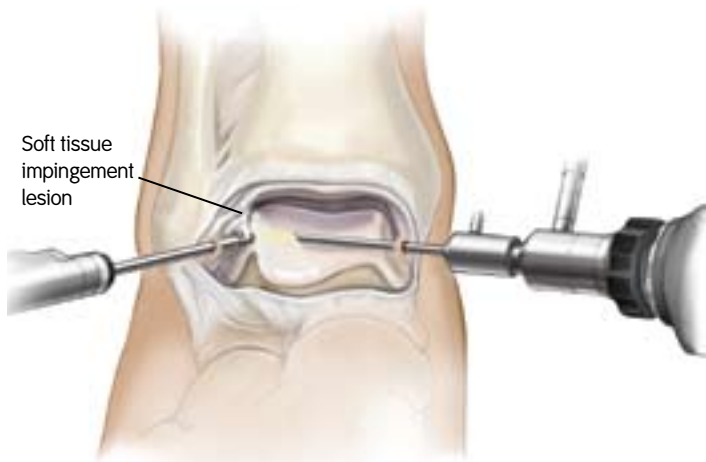


Figure 18. Viewed through the anteromedial portal, anterolateral soft tissue impingement with synovitis and fibrosis at the anterolateral gutter, this space is created by the bony capsular and ligament structures.

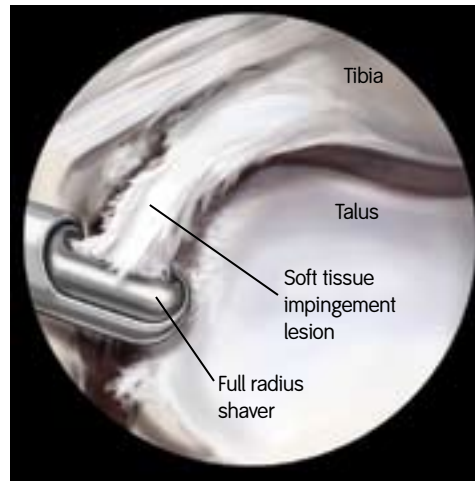


Figure 19. A 2.9 mm full-radius shaver is in position through the anterolateral portal for synovectomy and debridement.

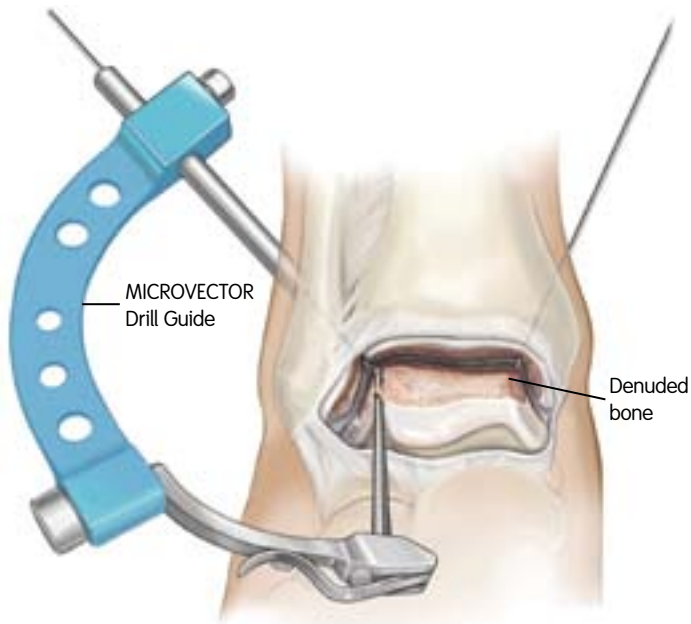


Figure 20. Guide pin placement for arthroscopic arthrodesis.



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, which is not normally lax (**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 MICROVECTOR drill guide to insert a guide pin for a large cannulated screw. Angle the guide pins at 30° in the coronal plane and 30° in the sagittal plane. (**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 fuses (**Figure 21**).

Post-operative Management

Following arthroscopy of the ankle, portal wounds are closed with 4-0 nonabsorbable 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. Patients are usually allowed to go home on the day of surgery, 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 six 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.

Additional Instruction

Prior to performing this technique, consult the Instructions for Use documentation provided with individual components – including indications, contraindications, warnings, cautions, and instructions.

Ordering Information

Some of the more common instruments for the foot and ankle are listed below. Call +1 800 343 5717 in the U.S. or contact your authorized Smith & Nephew representative to order any of the following components.

Small Joint Instruments

7207036 Small Joint Arthroplasty System

System includes:

- 014843 RAPTOR® Jr. Punch
- 014844 Blunt Nose Jr. Punch
- 014845 PITBULL® Jr. Grasper
- 014847 Closed Curette
- 014896 Osteotome
- 014848 Probe
- 7207019 Small Joint Arthroplasty System Sterilization Tray
- 013219 Small Joint Grasper
- 3499 DYOVAC® Straight Suction Punch, 2.5 mm

014846 Open Curette

72201795 Small Joint Curette System

System includes:

- 72201376 15° Open Curette, 4 mm
- 72201377 30° Open Curette, 2.5 mm
- 72201378 15° Open Curette, 2.5 mm
- 72201379 15° Anterior Lesion Curette, 2.5 mm
- 011703 Sterilization Tray

72202153 Microfracture Pick 90°

72202154 Microfracture Pick 65°

72202155 Microfracture Pick 40°

7207868 Micro Instrument System

System includes:

- 7207598 MicroGraspers, straight
- 7207599 MicroGraspers, Up 10°
- 7207600 MicroPunch, straight
- 7207601 Teardrop punch, right
- 7207602 Teardrop punch, left
- 7207935 Sterilization Tray; holds up to eight Micro Instruments, plus probe
- 3312 Probe
- 3499 DYOVAC® Straight Suction Punch, 2.5 mm
- 7207935 Sterilization Tray; holds up to eight Micro Instruments, plus probe

6900491 Magnetic "Golden" Retriever

4314 MICRO VECTOR® Drill Guide System

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 Cannulas and Inflow Cannulas

3672 2.9 Short Cannula with finger post

6900853 2.9 Cannula with inflow and outflow (smaller version)

7210715 3.8 Cannula, High flow

High-Definition Compatible Videarthroscopes

Non-Autoclavable

- 4130 2.7 mm Outer Diameter, 30° direction of view
- 4131 2.7 mm Outer Diameter, 30° direction of view
- 4132 2.7 mm Outer Diameter, 70° direction of view
- 7208133 1.9 mm Outer Diameter, 30° direction of view

Direct-View, Autoclavable

- 7205682 2.7 mm Outer Diameter, 30° direction of view
- 7205681 2.7 mm Outer Diameter, 30° direction of view

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

- 72201806 RAPFORMITE® 3.0 PK Suture Anchor with Needles
- 72201805 RAPFORMITE 3.7 PLA Suture Anchor with Needles
- 72202067 TWINFIX® 2.8 Ti Suture Anchor with Needles
- 72202039 2.6 mm Drill Kit for use with RAPFORMITE 3.0 PK
- 72202038 3.2 mm Drill Kit for use with RAPFORMITE 3.7 PLA
- 7209506 1.8 mm Drill for TWINFIX 2.8
- 7209118 Drill Guide for TWINFIX 2.8

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

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