

## TECHNIQUES IN ANKLE ARTHROSCOPY

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## INTRODUCTION

With the knowledge possessed by today's foot and ankle surgeon, the use of arthroscopy has become a useful and relatively atraumatic way to treat many different pathologic entities seen in the ankle joint. Since the development of arthroscopy, many surgeons have reported excellent to good results with its use for certain ankle pathologies.<sup>1-9</sup> Significant literature exists on the effectiveness of ankle arthroscopy for the treatment of chronic pain of the ankle secondary to impingement.<sup>1-5,9-11</sup> When observing surgeons that possess the skill and dexterity in using arthroscopy equipment, one can see how effective this technique can be. However, it takes time to develop the hand-eye coordination and understanding of the equipment's function in order to fully master this intricate technique. At the core of this technique is an understanding of the ankle joint anatomy and surrounding structures. The surgeon must know the relationships of all structures about the ankle so as to not damage neurovascular structures. Every curve and crevasse must be visualized mentally by the surgeon before beginning the procedure in order to be able to recognize and deal with the pathology that can be present. In the literature, there are reports by even the most skilled surgeons of permanent damage to the surrounding structures. The objective of this article is to present the technique of ankle arthroscopy and review the literature on this technique.

## PREOPERATIVE PREPARATION

The patient is transported to the operating room and placed supine on the operating table, then induction of general anesthesia is performed. All ankle arthroscopy cases should be performed under general anesthesia in order to acquire the level of relaxation needed to distract the ankle joint. A calf tourniquet is applied to the appropriate extremity to achieve hemostasis. If a tourniquet is not used, visualization can be impeded throughout the procedure. This can make visualization of pathology poor and even make it to the point where pathology can be missed by the surgeon. After the tourniquet is applied, knee support is placed beneath the knee to elevate the foot for the preoperative preparation, and maximize the use of gravity in order to distract the ankle as much as possible. The foot

is then prepped in the normal sterile fashion and the draping proceeds with the placement of a fluid collection bag beneath the operating site for collection of spilled fluid. A sterile ankle distractor is then placed on the operating table on the side of surgery and the strap applied to the foot. At this time the ankle is distracted by use of sterile attachment to the operating table and the surgeon is prepared to proceed with surgery (Figure 1). It should be noted that in the literature many surgeons have reported that they do not distract the ankle joint for this procedure because the distraction can make visualization of the medial and lateral ankle gutters difficult due to narrowing. However, at Northlake Medical Center, we routinely use a distractor for this procedure.

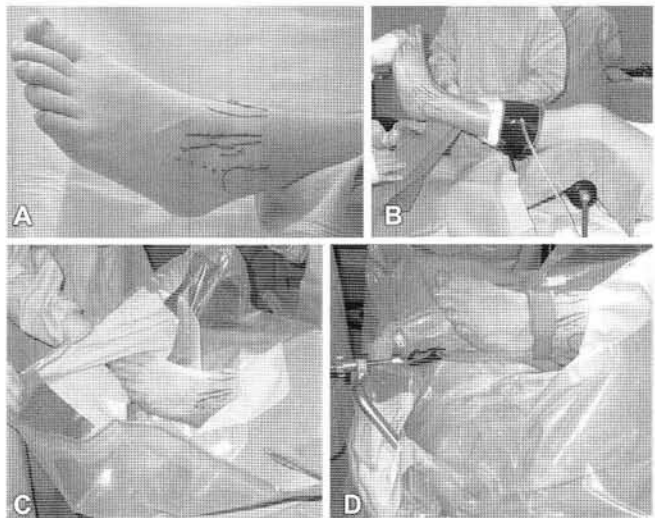


Figure 1. Preoperative preparation of the surgical field and extremity for the ankle arthroscopic procedure.

## ANATOMY

Before beginning with the pathologic ankle joint, one must be familiar with the healthy ankle joint as it appears through the lens of an arthroscope. The ankle joint can be divided into 4 basic fields in arthroscopic examination; the anteromedial gutter, the anterolateral gutter, the anterior recess, and the posterior recess. This is similar to the technique used by Lee et al for ankle examination with magnetic resonance imaging.<sup>12</sup> Often when performing

ankle arthroscopy the surgeon already has an idea of what portion of the ankle will present with pathology based on the results of the clinical examination. However, a thorough arthroscopic examination of the entire ankle should be performed to remove all pathology that is identified.

### **Anteromedial and anterolateral ankle**

The medial ankle gutter is comprised of the medial malleolus and medial talar articulation with the deep fibers of the deltoid ligament encountered inferiorly. The lateral ankle gutter is comprised of the articulation between the fibula and talar dome with the lateral collateral ligaments encountered inferiorly. One can identify the anterior talofibular within this field and repair can be accomplished as described by Kashuk et al.<sup>13</sup> Despite the fact that this repair can be done arthroscopically, the literature recommends not performing lateral ankle stabilization procedures via this approach. Meislin et al<sup>1</sup> recommends that patients with unstable ankles, as demonstrated by a positive talar tilt and/or anterior drawer examinations, have repair of those ligaments and then proceed with arthroscopy if it is still necessary. This recommendation is based on the observation that all patients in their study with “unstable” ankles were noted to have only fair to poor results following arthroscopic procedures. Also within this view one can visualize the most distal portion of the anterior tibio-fibular ligament, a structure that Bassett referred to as a distinct and separate ligament.<sup>2</sup> The majority of current ankle arthroscopy literature has been about this structure. Bassett et al also noted that 67% (4/6) of his patients had total alleviation of pain. The other 2 patients reported only mild discomfort with prolonged activity.

### **Posterior ankle**

Within the ankle there are also the anterior and posterior recesses, which are gapped only by the limitation of equipment. Within the posterior recess one can identify the posterior inferior tibio-fibular ligament and posterior ankle capsule. If one is to put the hallux through a range of motion while observing the posterior ankle capsule, one can also see the flexor hallucis longus tendon moving against the capsule. Henderson<sup>3</sup> noted that when creating the portal for the posterior lateral ankle, one should use a mini-open type of incision for visualization of the flexor tendon. This would be done in the case of inflammation of the tendon and if debridement of the tendon was needed. After performing this then the portal can be created in the ankle joint capsule with all of the soft tissue structures visualized. This technique would be

aided by the approach used by Lohrer et al<sup>10</sup> due to the fact that the patient was in the prone position. This allowed him to use a posteromedial and posteriolateral portal placement exclusively, secondary to the presentation of posterior ankle impingement.

## **SURGICAL TECHNIQUE**

### **Surface anatomy and insertion of portals**

In the initial stages of performing arthroscopy of the ankle it is very important to identify all of the neurovascular structures because the entrance of the arthroscope is done with a percutaneous technique, and one must be sure of the location of all neurovascular structures. When examining the anterior ankle one can often palpate and visualize all of these structures (i.e., the superficial peroneal nerve). It is recommended that one take the time to mark all of these structures as they cross the ankle joint (Figure 1). The anterior medial portal is located one centimeter medial to the tibialis anterior tendon and at the same level as the ankle joint. It is important to recognize the location of the great saphenous vein and the nerve that accompanies it. Next the lateral portal can be identified as being next to the extensor digitorum longus tendons. In this same area is the location of the superficial peroneal nerve and this must be recognized due to its higher rate of injury with this technique.<sup>4</sup>

After identification of the anatomy, a 12cc syringe with local anesthesia mixed with epinephrine is injected about the 2 anterior sites for portal placement. Following the delivery of local anesthesia into the area, the remaining amount in the syringe is injected into the joint. The purpose of this is to provide anesthesia about the sites of incision and, to provide hemostasis about the sites of incision placement. Then a large syringe filled with normal saline is used to distend the ankle joint by injection into the joint cavity through the anteromedial portal site.

A small stab incision is created at this site and dissection is deepened down to the deep fascia with a curved mosquito hemostat. This is why identification of all structures is so important because the incision is approximately 0.5 cm in diameter and visualization will be difficult. Once reaching the deep fascial layer, a blunt trochar and canula are inserted into the portal that has been created and the ankle capsule is pierced, entering the joint. It is recommended that one finger be placed on the skin while performing this step in order to utilize counter-pressure to control the depth of insertion and avoid possible damage to the articular surface. One can be

assured that they have entered the joint by removing the blunt obturator and seeing fluid escape from the ankle joint that was injected preoperatively to distend the joint. It is at this time that the anterior medial portal has been established and attention is directed to the anterior lateral portal.

Once the anterior medial portal is prepared, the canula is maintained with the incision as the trochar is removed and the arthroscope inserted (Figure 2). If visualization is poor then the ingress/egress system can be inserted into the canula and allowed to clean the joint of all debris and blood. Either way the camera is inserted into the anterior medial portal and is pushed over to the site of anticipated anterior lateral incision placement as planned preoperatively. The camera has a light source and will illuminate the site of entry that will maximize visualization. It is usually at this point that the lights in the operating room can be dimmed in order for the light source to be viewed most effectively. This will also allow the surgeon to see if the superficial peroneal nerve is within the proposed incision site. Once this site is marked, then a similar incision to the anterior medial portal is created just lateral to the extensor digitorum longus tendons at the level of the ankle joint. One must make sure to coordinate the proposed site of entry with the preoperative markings of the anatomy as to assure oneself that damage to neurovascular structures is avoided. Once one has decided on the site of the stab incision then the camera is used to visualize the entry of the second portal into the joint on the monitor. Once this has been performed then the trochar is removed and the ingress/egress pump is placed into the joint.

Once these steps have been performed then the ankle joint can be effectively examined arthroscopically. It is recommended that the ingress/egress be used with a pump to have the water flow into the joint. At our institution, a pump is used and placed at either 80 to 100 mm Hg. If there is loss of visualization then one reason for this might be lack of effective fluid flow, and the pump should be increased. An initial pump pressure of 80 is used, which can be increased to 100 without over distending the joint. Once this has been performed, visualization is usually improved and the procedure can be continued.

At this point the ankle examination is begun by viewing all 4 areas of the ankle joint as previously described. If you have trouble with the examination of the posterior ankle recess, you can create a posterolateral ankle portal. Although usually only anteromedial and anterolateral portals are used, one might have difficulty reaching this portion of the ankle. If the surgeon is



Figure 2. The established anteromedial portal. Note the proximity to the tibialis anterior tendon at the level of the ankle joint.

having trouble with the instruments reaching or is pressing upon the articular cartilage of the talus to reach within these contours, then creation of the portal posterior lateral is advised. This portal is created just lateral to the Achilles tendon at the level of the ankle joint. The surgeon must be mindful to observe the course of the sural nerve and the lesser saphenous vein with this portal placement. As with the other portal placement, a small stab incision is created, then using a small hemostat to bluntly spread the subcutaneous tissue a trochar loaded within a canula is used to tent the tissues. This tenting can be visualized with the camera to confirm appropriate portal placement into the joint.

### Conclusion

The literature reports excellent rates of relief of chronic pain (75-100%) with the use of ankle arthroscopy.<sup>1,3,5,9,11</sup> Patients presenting with this type of ankle pathology are primarily in the 4th or 5th decade, and are athletic. However, due to pain, athletic activities are difficult to perform. There is usually a history of inversion mechanism of sprain. On physical exam the patient will have a "click" at the anterior ankle suggestive of impingement.<sup>1</sup> Bone scan and MRI findings are helpful in differential diagnosis, but are not very specific for impingement.<sup>11,12</sup>

This patient population has an excellent potential for healing and have shown to recover very well post-operatively. A patient presenting with the previously described profile, and 3 or more months of failed conservative treatment is an ideal candidate for ankle arthroscopy.

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