Technical Note

Medial Transmalleolar Portal Technique for Ankle Arthroscopic Headless Screw Fixation of Talar Osteochondritis Dissecans Lesions

Patrick A. Massey, M.D., Wayne Scalisi, M.D., Carver Montgomery, B.S., Kaylan N. McClary, M.D., Jennifer S. Walt, M.D., Giovanni F. Solitro, Ph.D., and Shane Barton, M.D.

Abstract: This article describes a technique for arthroscopic fixation of an osteochondritis dissecans (OCD) lesion of the medial talar dome with headless compression screws. This technique involves creation of a medial transmalleolar portal using a guide and drill. The medial transmalleolar portal grants perpendicular access for screw fixation of OCD lesions in addition to the potential for osteochondral autograft transplantation (OAT). Advantages include access to the medial talar dome without performing a medial malleolar osteotomy. After completion of OCD fixation, an inverted osteochondral plug can be used to backfill the portal.

Osteochondritis dessicans (OCD) is a condition of synovial joints and is defined as a defect of the articular cartilage and subchondral bone.[1,2] OCD lesions affecting the ankle joint were first described in 1922 by Kappis and later classified by Berndt and Harty in 1959.[2] Osteochondral lesions of the talus (OLTs) are frequently associated with traumatic events; however, other atraumatic etiologies include vascular or synovial insult, microtrauma, chronic ankle instability, genetic predisposition, and endocrine or metabolic abnormalities.[2,3]

Nondisplaced, stable OLTs are typically treated with a nonoperative protocol, but nonoperative treatment is typically more successful in pediatric populations.[4] In a systematic review by Verhagen et al.,[4] it was found that nonoperative treatment (consisting of a period of immobilization, progressive weightbearing with physical therapy emphasizing peroneal strengthening, range of motion, and proprioceptive training) has a success rate of only 45%. Displaced or unstable OLTs, or lesions that have failed conservative therapy, are amenable to various arthroscopic or open operative techniques including microfracture, drilling, osteochondral autologous transplantation, osteochondral allograft transplantation, juvenile allograft transplantation, biological adjuncts, bulk transplantation, or talar resurfacing.[1-5]

OCD lesions of the medial talus provide unique challenges owing to the highly congruent talocrural joint. Depending on lesion location and size, a clinician must decide if a medial malleolar osteotomy is required to grant sufficient access to the medial talar lesion. Medial malleolar ostomies are associated with complications including delayed union, nonunion, painful hardware, and posttraumatic arthritis.[5] The ability to avoid a medial malleolar osteotomy has numerous benefits.

To avoid osteotomy-associated complications, additional techniques have been developed. In one study, Perera et al.[6] showed that it is possible to view and work on tibial OCD lesions from a transtibial approach without the need for a malleolar osteotomy, with a

From the Department of Orthopaedic Surgery, Louisiana State University Health, Shreveport, Louisiana, U.S.A. (P.A.M., W.S., G.F.S., S.B.); the School of Medicine, Louisiana State University, Shreveport, Louisiana, U.S.A. (C.M.); the Department of Orthopaedic Surgery, Houston Methodist, Houston, Texas, U.S.A. (K.N.M.); and the Department of Orthopaedic Surgery, University of Iowa, Iowa City, Iowa, U.S.A. (J.S.W.).

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Address correspondence to Patrick A. Massey, M.D., Department of Orthopaedic Surgery, Louisiana State University, 1501 Kings Highway, Shreveport, LA 71103, U.S.A. E-mail: patrick.massey@lsuhs.edu

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significant decrease in morbidity and a substantial increase in activity. They reported a case of a tibial OCD lesion that they treated with an osteochondral autologous graft. This lesion was approached in an antegrade direction through the medial tibia to gain perpendicular access to the tibiotalar joint. An Acuflex PCL jig was used to guide drilling and an autologous osteochondral graft was inserted cartilage side down via the transtibial portal in order to restore the tibio-talar articular surface.[6] In the following technique, we present a medial transmalleolar technique for accessing the medial talus for screw fixation of OCD lesions (Fig 1).

Surgical Technique

The patient is prepared for a standard ankle arthroscopy and placed in the supine position. Standard ankle distraction is applied. Regional landmarks are palpated and outlined, followed by injection of 30 cc normal saline into the joint. Standard anteromedial and anterolateral portals are established. A standard diagnostic evaluation is performed, and the medial OLT is identified (Fig 2). The scope is then inserted through the anterolateral portal to allow the ACL guide to be inserted into the anteromedial portal (Video). The ACL guide is placed over the OLT (Fig 3). The location at which the guide sleeve contacts the skin overlying the medial malleolus is marked. A medial incision is made over this point, and dissection is carried down to bone. This incision is similar to the standard incision used for the approach to the medial malleolus.

The ACL guide is advanced onto the medial malleolus bone (Fig 4). A 2.4-mm guide pin is drilled through the

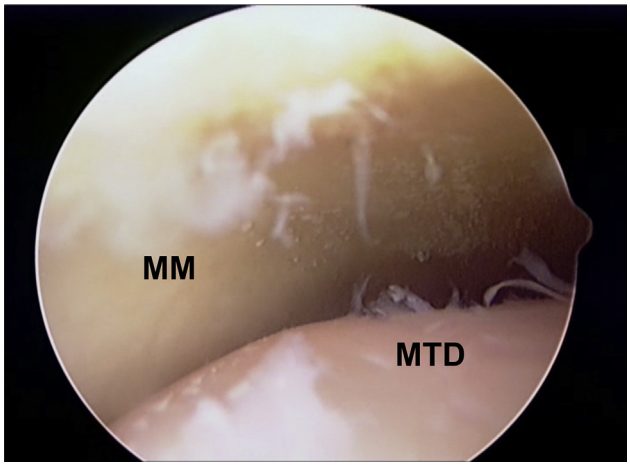

Fig 2. Left ankle medial malleolus (MM) and medial talar dome (MTD) viewed through the anteromedial portal. The medial malleolus articular surface is visualized.

ACL guide from the medial malleolus to the tibiotalar joint. The ACL guide is removed, and a hemostat is inserted through the anteromedial portal to clamp the end of the guide pin to protect the talus (Table 1). Next, a 6-mm reamer is used over the guide pin from the medial malleolus to the tibiotalar joint, creating the medial transmalleolar portal (Fig 5). An arthroscopic cannula can be inserted into the portal to prevent arthroscopy fluid extravasation.

A headless screw guide pin is then inserted through the medial transmalleolar portal (Fig 6) for the headless compression screw (Biomet, Warsaw, IN). A depth gauge is placed over the guide pin to determine screw length, and a drill is inserted over the guide pin. The headless compression screw is slowly inserted over the

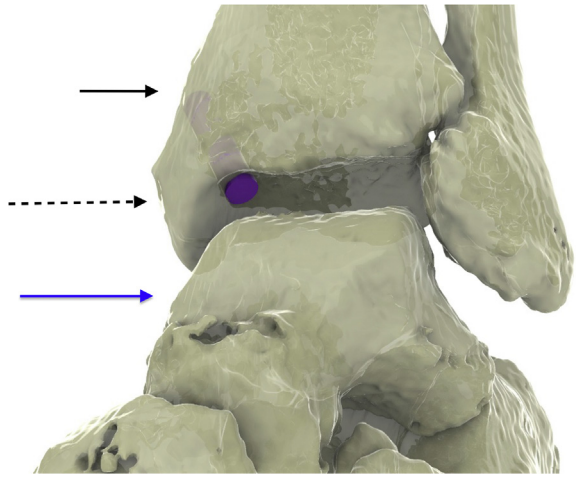

Fig 1. A computer-generated 3-dimensional illustration of a left ankle. The medial transmalleolar tunnel is depicted with a purple cylinder. The entrance to the portal is on the medial tibia (solid black arrow). The portal exits into the tibiotalar joint (hashed black arrow). The medial talus (blue arrow) dome accessed through this portal, without an osteotomy.

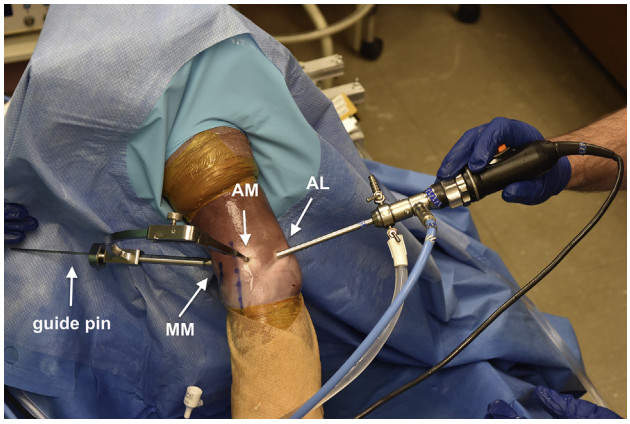

Fig 3. Left ankle viewed from the surgeon's point of view. The surgical setup is pictured with the arthroscope in the anterolateral (AL) portal and tip of the ACL guide in the anteromedial (AM) portal. The guide sleeve is positioned over the medial malleolus (MM), marking the trajectory of the medial transmalleolar portal.

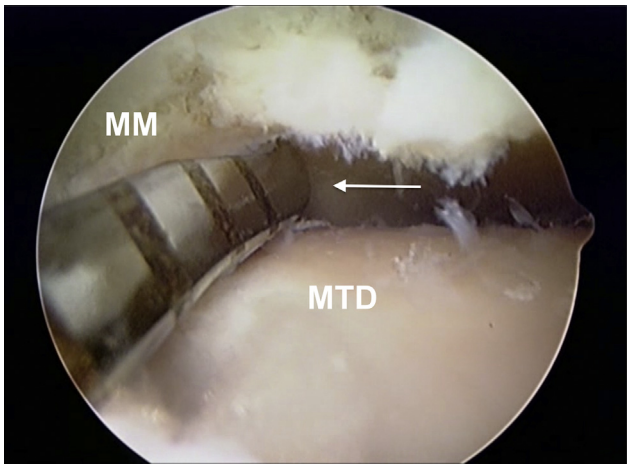

Fig 4. Left ankle medial malleolus (MM) and medial talar dome (MTD) viewed through the anterolateral portal with the tip of the ACL guide inserted through the anteromedial portal. The tip of the ACL guide (white arrow) is upside down over the OCD lesion on the talus to correctly position the guide sleeve for accurate insertion of a Kirschner wire through the medial malleolus into the tibiotalar joint.

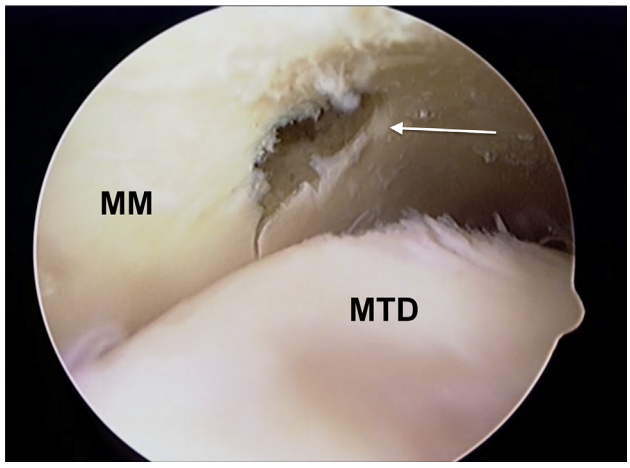

Fig 5. Left ankle medial malleolus (MM) and medial talar dome (MTD) viewed through the anteromedial portal. The distal end of the 6-mm medial transmalleolar portal (white arrow) is shown. The portal is created by over drilling with a 6-mm reamer.

guide pin into the OLT (Fig 7), taking care to prevent stripping. Additional screws can be placed more anterior or posterior if needed for larger OLTs by dorsiflexing and plantarflexing the ankle. Screw heads can be visualized through the medial transmalleolar portal (Fig 8).

An osteochondral plug is used to fill the medial transmalleolar hole. An autologous or allograft plug can be used. Before graft placement, a dilator is inserted medially through the transmalleolar hole. A 7-mm dilator is used for a 6-mm hole. The dilator is advanced in antegrade fashion down to the edge of the tibial cartilage. A 7-mm osteochondral graft is then inserted cartilage side down under direct visualization with the arthroscope (Fig 9). The osteochondral plug can be inserted at the time of the primary procedure, or the plug can be inserted at the later procedure if hardware removal is desired (Fig 10).

Postoperative Rehabilitation

The main focus of the postoperative period is to maintain range of motion while limiting shear forces on the cartilage. The ankle is placed in a short leg splint for the first week and then transitioned into a removable controlled ankle motion (CAM) walking boot. For the first 6 weeks, rehabilitation consists of gentle range of motion with passive stretching. The ankle is nonweightbearing for the first 6 weeks. In the next 6 week, advancement to full weightbearing and proprioception exercises are performed. After 12 weeks, more aggressive strengthening and endurance training is permitted.

Discussion

Medial OLTs present a challenge to clinicians owing to the highly congruent talocrural joint. Depending on the location and size of the lesion, both arthroscopic and open operative options exist.[7] Currently, larger

Table 1. Pearls and Pitfalls

Pearls	Pitfalls
Make sure there is adequate distraction on the ankle	Do not use an ACL guide with a sharp tip
Use an ACL guide in the anteromedial portal for drilling the portal at the correct trajectory	Be careful not to overcompress the OCD
Hemostat the guide pin before drilling the portal to protect the talus cartilage	If drilling before screw fixation is not deep enough, screw insertion may be difficult, or it will overcompress the OCD cartilage
Insert an arthroscopic cannula into the transmalleolar portal for better fluid control	
Fully drill, over the headless screw guide pin, the same depth as the screw length you will use	
Use an ACL tunnel dilator to dilate the hole 1 mm larger than the OAT plug stopping 5 mm before the tunnel exit in the joint (for easy insertion of the OAT plug)	

Abbreviations: ACL, anterior cruciate ligament; OAT, osteochondral autograft transfer; OCD, osteochondritis dessicans.

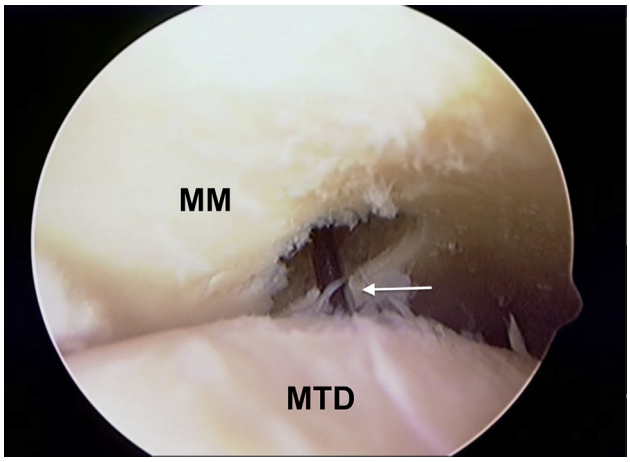

Fig 6. Left ankle medial malleolus (MM) and medial talar dome (MTD) viewed through the anteromedial portal. A guide pin (white arrow) is inserted through the medial transmalleolar portal and inserted into the OCD lesion on the medial talar dome.

(>187 mm^2, 1870 mm^3) and more posteriorly located (zones 7 to 8) medial OLTs have required surgeons to perform a medial malleolar osteotomy to gain adequate access to the lesion.[8-10] We report our technique for fixation of medial OLTs using a medial transmalleolar portal. There are many advantages to this portal, including access to difficult-to-reach regions of the talus and avoiding an osteotomy (Table 2). In an attempt to avoid malleolar osteotomies, other clinicians have explored new techniques to gain talar dome access without an osteotomy.

A study by Tosun[11] described a posteromedial approach to posteromedial talar dome lesions. This approach gives access to lesions in this location without a medial malleolar osteotomy; however, it requires a 6-cm longitudinal incision and runs the risk of damaging the posterior tibial artery and tibial nerve.[11]

Combined posteromedial and posterolateral arthroscopic portals have also been described that give access to the posterior process of the talus, zones 7 to 9, and more posteriorly located lesions in zones 4 to 6.[12,13] This technique offers the advantage of avoiding complications associated with posteromedial and posterolateral arthrotomies. However, use of these portals runs

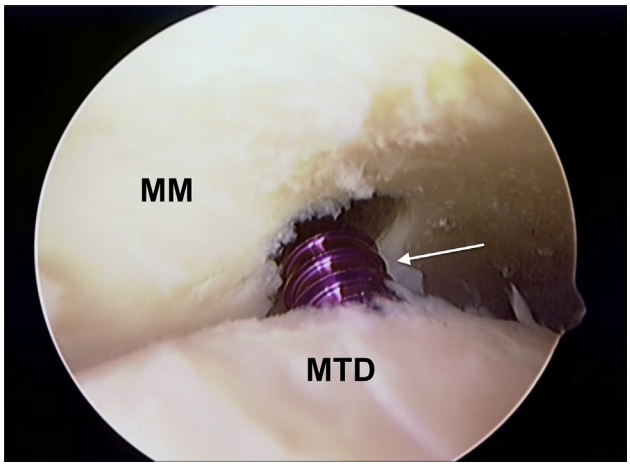

Fig 7. Left ankle medial malleolar (MM) and medial talar dome (MTD) viewed from the anteromedial portal. A headless compression screw (white arrow) is inserted through the medial transmalleolar portal over the guide pin and inserted into the OCD lesion.

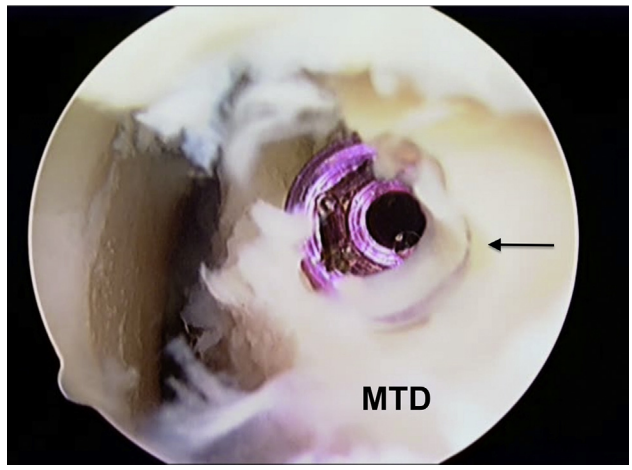

Fig 8. Left ankle medial talar dome (MTD) viewed through the medial transmalleolar portal. The camera is inserted medially through the medial malleolus through the portal that we have created to view the tibiotalar joint from above. The headless compression screw (black arrow) can viewed through the portal that has been created.

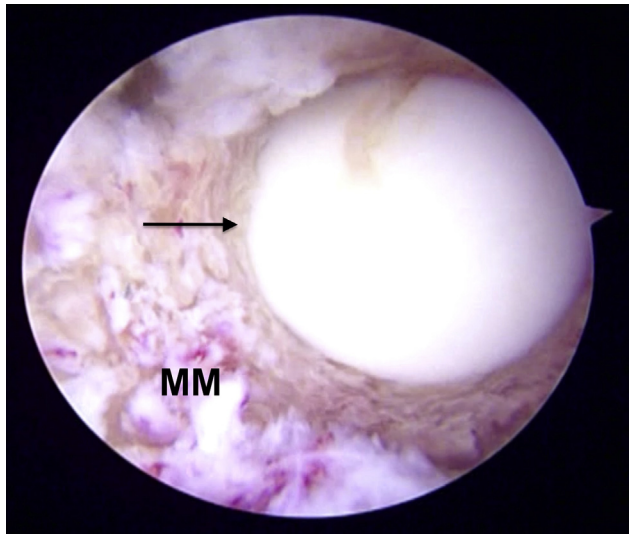

Fig 9. Right ankle medial malleolus (MM) tunnel viewed through an anteromedial portal. The camera has been inserted into the opening of the medial transmalleolar portal into the tibiotalar joint. The osteochondral graft (black arrow) has been inserted into the portal, cartilage side down.

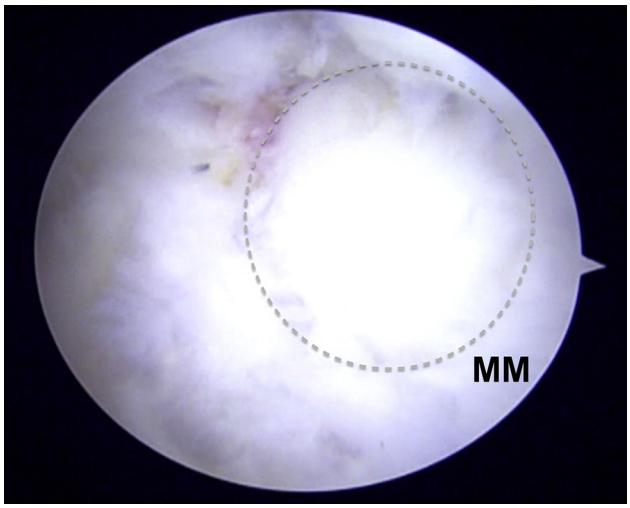

Fig 10. Right ankle medial malleolus viewed through an anteromedial portal. The osteochondral graft (dashed gray circle) has been inserted through the medial transmalleolar portal until the cartilage is flush with the medial malleolus (MM) cartilage surface.

the risk of damage to the tibial nerve and posterior tibial artery and vein medially and sural nerve laterally.[12,13]

The other standard portals include anteromedial and anterolateral, which reliably allow access to zones 1 to 3.[12] The anteromedial portal has potential risks to the anterior tibialis and saphenous neurovascular bundle, and the anterolateral portal risks damage to the superficial peroneal nerve.[14,15] Limitations to the 4 standard ankle arthroscopic portals include inadequate perpendicular access for internal fixation of centrally located talar dome lesions.[16]

Galla et al.[17] successfully demonstrated treatment of OLT with autologous matrix-induced chondrogenesis (AMIC) without a malleolar osteotomy. Their approach required anterolateral and anteromedial arthrotomies to gain adequate access to the talar lesions. This technique avoids the complications of a malleolar osteotomy, but it risks damage to anterolateral and anteromedial neurovascular structures during dissection.

Table 2. Advantages and Disadvantages

Advantages	Disadvantages
Minimally invasive	Potential for cartilage damage with instrumentation
No medial malleolus osteotomy required	Risk to saphenous vein and nerve
Access to a large area of the medial talus	Potential damage to medial tibial cartilage
No need for posterior medial portal with associated risks	
No need for posterior or anterior arthrotomies	

In regard to the technique described here, we believe that there is potential risk to the saphenous nerve, so a mini-open approach to the medial malleolus should be performed with identification of any neurovascular structures.[18] This approach is similar to the standard technique for open medial malleolar fixation, likely with similar risks.[19,20]

Our proposed technique describes creating a medial transmalleolar portal, thereby granting access to these hard-to-reach areas of the talus without performing a medial osteotomy. This technique also circumvents the need for extensive soft tissue dissection and avoids potential complications associated with open techniques.[11,17,19,20] Fixation of talus OCD with screws is ideal for nondisplaced or minimally displaced lesions with intact cartilage.[21,22] Other techniques such osteochondral autograft may be possible through the medial transmalleolar portal. The ability to fix larger lesions of the talus in difficult-to-reach areas without the need for an osteotomy using a medial transmalleolar arthroscopic portal shows great promise, as it could potentially reduce the complications associated with malleolar osteotomies.

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