Outside-In Deep Medial Collateral Ligament Release During Arthroscopic Medial Meniscus Surgery

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Abstract: Arthroscopic partial medial meniscectomy is a very common orthopaedic procedure performed for symptomatic, irreparable meniscus tears. It is usually associated with a very good outcome and minimal complications. In some patients with tight medial compartment, the posterior horn of the medial meniscus can be difficult to visualize, and access in this area with instruments may be challenging. To increase the opening of the medial compartment, after valgus-extension stress position of the knee, different techniques of deep medial collateral ligament release have been described. The outside-in pie-crusting technique shown in this technical note has documented effectiveness and good outcomes with minimal or no morbidity.

Knee arthroscopy for meniscal tears is one of the most widely performed orthopaedic procedures. The posterior horn of the medial meniscus is a common site for tears,[1] and very often a partial meniscectomy is necessary for irreparable tears. Usually, the arthroscopic meniscectomy is performed with successful clinical outcomes and low rates of complications.[1-3] However, in some cases, the medial compartment is poorly exposed with standard extension-valgus knee position and tears in the posterior horn of the medial meniscus can be missed or poorly visualized.[4] This can lead to improper tear configuration understanding, difficult access of instruments to the tear site, iatrogenic chondral damage, or missed diagnosis.[1,5-7]

Several techniques have been described to improve visualization in patients with tight medial compartments to facilitate posterior horn tear evaluation and treatment without difficulty.[5,6,8-10] The percutaneous outside-in technique of pie-crusting the posteromedial capsuloligamentous structures with the use of a needle, presented in this note, has been documented to be safe and effective with no immediate or long-term complications.[1]

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Surgical Technique

Patient Setup

Routine knee arthroscopy setup is prepared. Under general or spinal anesthesia, the patient is positioned supine on the operating table and the knee flexed to 90° with a side post at the level of the proximal thigh and a foot support. We routinely use a nonsterile thigh tourniquet inflated to 300 mm Hg. The lower limb is prepped and draped in a standard fashion for knee arthroscopy.

Establishment of Portals

The anterolateral (AL) portal is established first. We use a high AL portal, just lateral to the patellar tendon, at the level of the distal pole of the patella, with the knee flexed to 90°. The arthroscope (4 mm, 30°, Conmed, Linvatec) is introduced and the joint is inspected in a routine fashion. The anteromedial (AM) portal is established second, under direct vision, with the use of a needle, above the anterior horn of the medial meniscus. For medial compartment evaluation, the knee is placed in a standard valgus-extension position.

Evaluation of the Medial Compartment and Meniscus Tear

A 4-mm tip probe is introduced through the AM portal, while the knee is held in valgus-extension

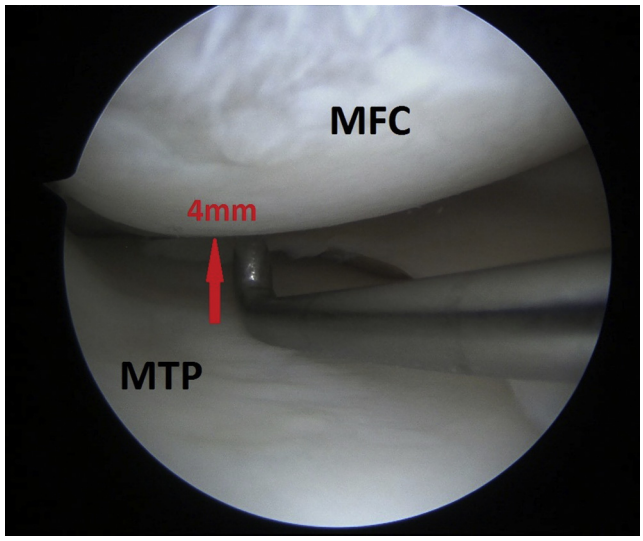

Fig 1. A 4-mm tip probe introduced through the anteromedial portal measuring the distance between the medial femoral condyle (MFC) and the medial tibial plateau (MTP). Camera in the standard anterolateral viewing portal. Right knee. Standard valgus-extension stress position.

position and the distance between the medial femoral condyle and the medial tibial plateau is measured (Fig 1). With the tip of the probe held in a vertical position where the distance between the femoral condyle and the tibial plateau is smallest, the opening of the medial compartment is approximated. If this distance is less than 6 mm, we find that it is necessary to

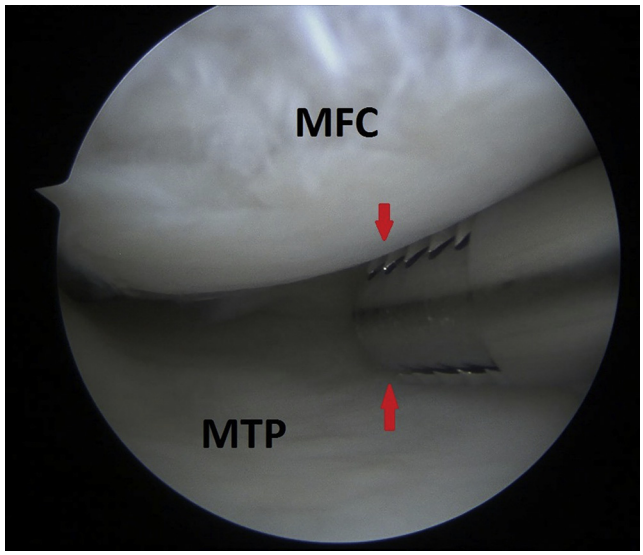

Fig 3. A 4.2-mm shaver blade introduced through the anteromedial portal trying to reach the tear in the posterior horn of the medial meniscus. Note the inability to pass between the medial femoral condyle (MFC) and the tibial plateau (MTP) (arrows). Camera in the standard anterolateral viewing portal. Right knee. Standard valgus-extension stress position.

increase the space by pie-crusting the deep medial collateral ligament (MCL). Also, with the probe, the tear in the posterior horn of the medial meniscus is evaluated and accessibility is tested (Fig 2). If the tear is poorly visualized, the release is performed. We also introduce the shaver (4.2 mm, Conmed, Linvatec) and

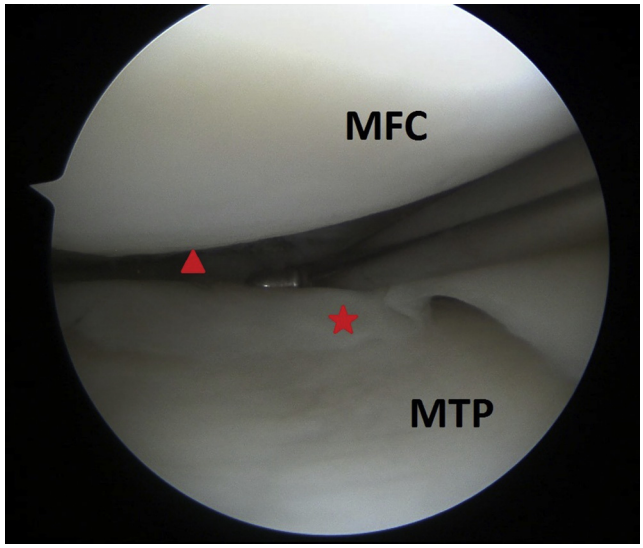

Fig 2. A probe introduced through the anteromedial portal evaluating the tear in the posterior horn of the medial meniscus. Part of the tear (star) can be seen and palpated. Note the poor visualization in the posterior horn (triangle). Camera in the standard anterolateral viewing portal. Right knee. Standard valgus-extension stress position. (MFC, medial femoral condyle; MTP, medial tibial plateau.)

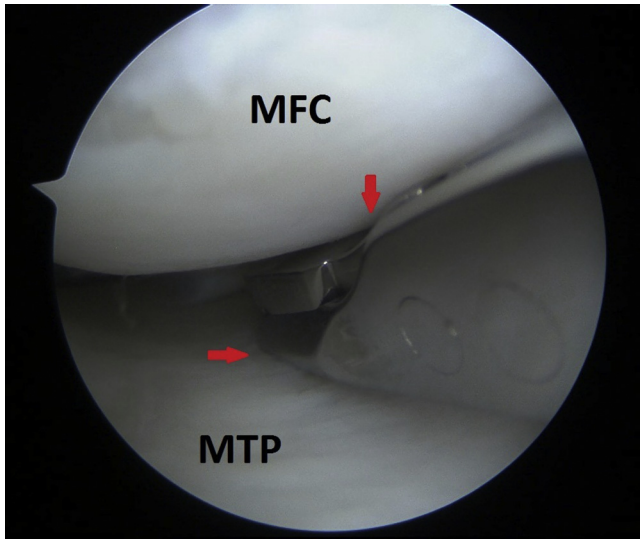

Fig 4. Basket forceps (Linear Wide Bite Punch, 3.3 mm diameter, 130 mm, Conmed, Linvatec) introduced through the anteromedial portal trying to reach the tear in the posterior horn of the medial meniscus. Note the inability to pass between the medial femoral condyle (MFC) and the tibial plateau (MTP) (arrows). Camera in the standard anterolateral viewing portal. Right knee. Standard valgus-extension stress position.

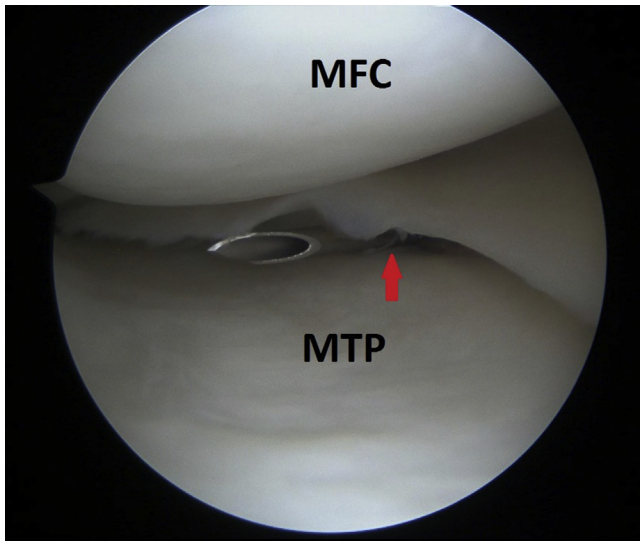

Fig 5. Eighteen-gauge (1.2 × 40) hypodermic needle (KD-FINE) introduced in the desired location, in the posteromedial compartment between the meniscus and the tibial plateau to release the deep medial collateral ligament. Camera in the anterolateral viewing portal. Right knee. Standard valgus-extension stress position. (MFC, medial femoral condyle; MTP, medial tibial plateau.)

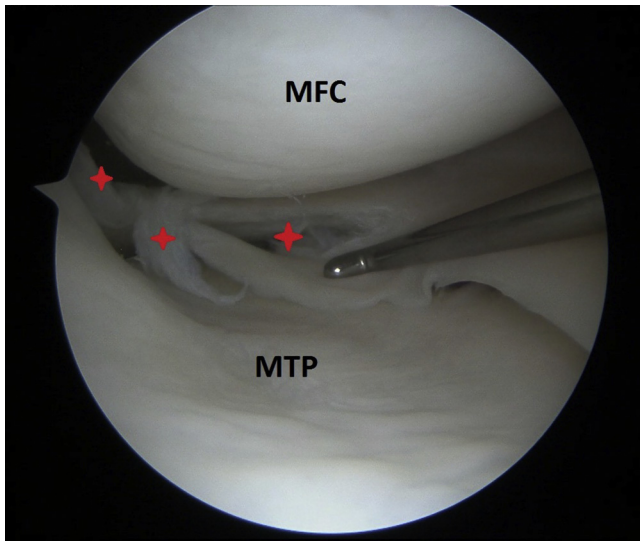

Fig 7. The probe introduced through the anteromedial portal evaluating the tear in the posterior horn of the medial meniscus. Note the improved visualization and access to the tear site (stars) as compared with Figure 2. Camera in the standard anterolateral viewing portal. Right knee. Standard valgus-extension stress position. (MFC, medial femoral condyle; MTP, medial tibial plateau.)

the basket forceps (Linear Wide Bite Punch, 3.3 mm diameter, 130 mm, Conmed, Linvatec) through the AM portal in an attempt to reach the tear site. If this is impossible (Figs 3 and 4), the release is performed.

MCL Perforations

A standard 18-gauge (1.2 × 40) hypodermic needle (KD-FINE) is used for the release. Maintaining the valgus-extension position, the needle is introduced percutaneously at the level of the joint line in the

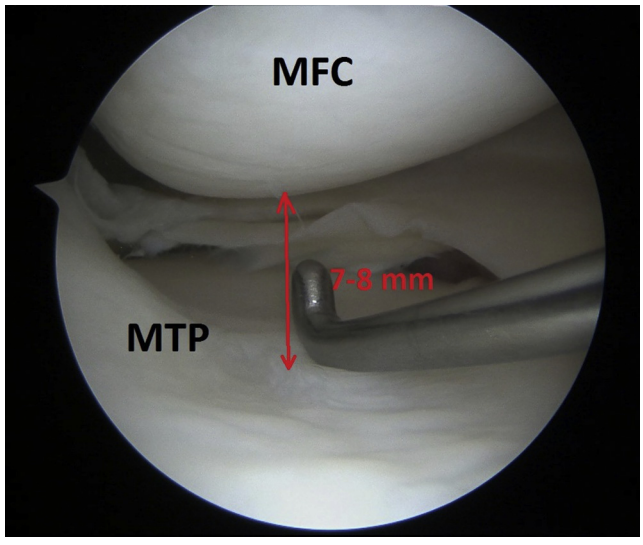

Fig 6. A 4-mm tip probe introduced through the anteromedial portal measuring the distance between the medial femoral condyle (MFC) and the medial tibial plateau (MTP) showing the increased space in the medial compartment as compared with Figure 1, obtained after the outside-in release of the deep medial collateral ligament. Camera in the standard anterolateral viewing portal. Right knee. Standard valgus-extension stress position.

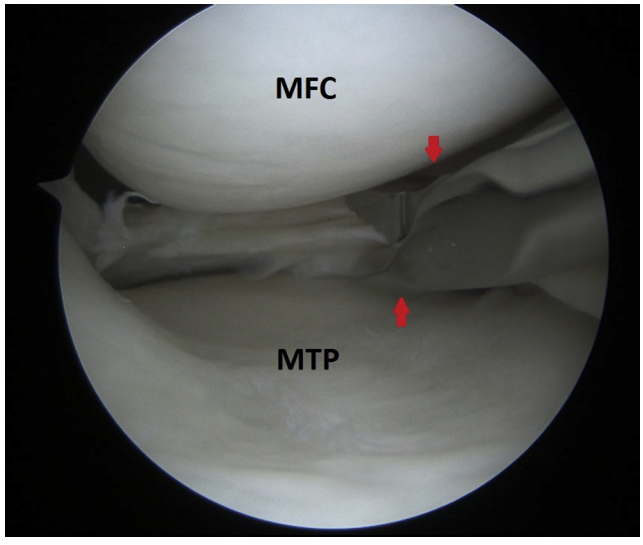

Fig 8. Basket forceps (Linear Wide Bite Punch, 3.3 mm diameter, 130 mm, Conmed, Linvatec) introduced through the anteromedial portal performing the meniscectomy in the posterior horn of the medial meniscus. Note the good clearance between the medial femoral condyle (MFC) and the tibial plateau (MTP) (arrows). Camera in the standard anterolateral viewing portal. Right knee. Standard valgus-extension stress position.

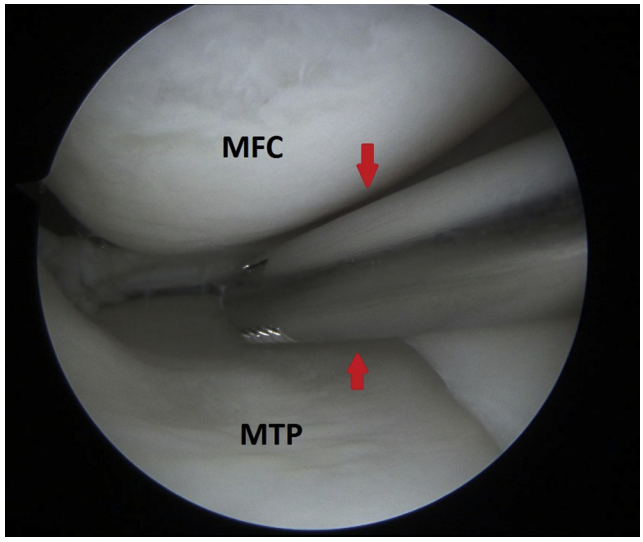

Fig 9. A 4.2-mm shaver blade introduced through the anteromedial portal to the tear site in the posterior horn of the medial meniscus. Note the good clearance between the medial femoral condyle (MFC) and the tibial plateau (MTP) (arrows). Camera in the standard anterolateral viewing portal. Right knee. Standard valgus-extension stress position.

posterior two-thirds on the medial side of the knee, under arthroscopic control in the posteromedial compartment, between the meniscus and the tibial plateau (Fig 5). We have found this spot to be the most effective in releasing the MCL, and we do not puncture above the meniscus or in any other places. Sometimes, a few punctures are needed until this spot is located. When this position is found, the needle is not redrawn out the skin anymore, and multiple perforations are performed until the medial joint space increases. This is usually accompanied by a popping sound and feel. After the first 3 to 4 punctures in the desired location, the probe is reinserted through the AM portal to evaluate the degree of opening obtained. If this is insufficient, the punctures are continued until the space is widened enough. From our experience, at approximately 6 to 8 mm, a complete visualization of the posterior horn of the medial meniscus is obtained and proper instruments can be introduced and manipulated without obstruction or risk of iatrogenic cartilage injury (Figs 6-9 and Video 1). The pearls and pitfalls with this technique are summarized in Table 1.

Table 1. Pearls and Pitfalls With Outside-In MCL Release During Arthroscopic Medial Meniscus Surgery

Pearls	Pitfalls
Introduce the needle gently until the perfect spot is located between the medial meniscus and the tibial plateau in the posteromedial corner	Iatrogenic injury to intra-articular (cartilage, meniscus) or extra-articular (vein, nerve) structures with the needle
After this spot is located do not retract the needle completely and puncture 3-4 times in this area	Complete release of the MCL
Measure the distance in the medial compartment with the probe in between punctures to avoid over-release	

MCL, medial collateral ligament.

Table 2. Advantages and Risks With Outside-In Medial Collateral Ligament Release During Arthroscopic Medial Meniscus Surgery

Advantages	Risks
Documented good results and minimal complications	Over-release, but no residual laxity described to our knowledge
Needle access independent of intra-articular structures in comparison with the inside-out technique	Injury to the saphenous vein and nerve
Easy and effective	
Allows easy access and instrumentation to the tear site without risk of iatrogenic cartilage injury	

Discussion

Proper visualization of the posteromedial compartment of the knee is mandatory for adequate diagnosis and treatment of tears that involve the posterior horn of the medial meniscus.[6] Especially in tight knees, the degree of opening of the medial compartment by valgus-extension stress position may not be enough and additional procedures may be needed to achieve an adequate working space.[5] The posterior part of the MCL fibers, just proximal to the joint line, have the highest strains during valgus-extension stress position,[1] so this part of the MCL should be released. Although different techniques have been described to achieve increased space in the medial compartment,[1,5,6,10,11] the technique described in this note is very effective in increasing the medial joint space in tight knees and has documented good outcome with very little or no additional morbidity.[1,5,12] Javidan et al.[10] described an inside-out technique for releasing the deep MCL with the use of a blade instrument introduced through the AL portal while viewing from the AM portal. The authors showed the same location for the release, that is the undersurface of the medial meniscus, at the posteromedial part of the compartment. One potential disadvantage of inside-out techniques is that the access of the instruments to the desired location can be influenced by intra-articular structures. On the other hand, the outside-in technique has the theoretical disadvantage of potentially injuring other structures like the saphenous vein and nerve (Table 2). However, this has not been a clinical issue.[1,12] Furthermore,

learning this outside-in technique may aid young arthroscopy trainees in learning the outside-in meniscus suture technique.

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