Technical Note

Double-Needle Technique for Temporary Stabilization of Unstable Meniscal Tear During All-Inside Meniscal Repair

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Abstract: Meniscus tears are common in patients with primary or revision anterior cruciate ligament injuries. Given their important mechanical role in the joint, efforts are being made to repair as much of the meniscus tear as possible. However, all-inside repair might be challenging in case of an unstable tear due to the dislocation of the meniscal flap after deploying the first anchor. Therefore, we describe the details of our technique that allows the surgeon to stabilize the meniscal tear before all-inside repair, ensuring the reduction of the tear throughout the entire procedure.

Meniscus tears are commonly observed in patients with primary or revision anterior cruciate ligament (ACL) injuries.[1-3] It has been widely reported that both partial and total meniscectomy result in increased cartilage contact stresses, and these mechanical changes accelerate joint degeneration, leading to early osteoarthritis.[4] Therefore, it is theoretically desirable to repair as much of the meniscus tear as possible. With the availability of new devices, all-inside repairs are growing in popularity due to decreased surgical time, no need for additional skin incisions, and faster postoperative recovery.[5] However, all-inside repair might be challenging in case of an unstable tear due to the dislocation of the meniscal flap after deploying the first anchor, similar to the effect when pulling the string of a bow (bow effect). We report the details of our technique, which is cheap and technically low-demanding but allows the surgeon to stabilize the meniscal tear before all-inside repair, ensuring the reduction of the tear throughout the entire procedure. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Surgical Technique

The surgery could be performed with either general or regional anesthesia. The patient is positioned supine with the operated leg placed in a leg holder (Maquet knee positioning device; Rastatt) and a thigh tourniquet positioned. The operative leg is prepped and draped in the usual sterile fashion. The leg is exsanguinated, and the tourniquet is inflated. A standard anterolateral

Table 1. Equipment Required for Technique

Fast-Fix 360° repair system (Smith & Nephew)*
Epidural needle: i.e., White Tuohy needle 17 gauge (Vygon)†
Injection needle: i.e., 21 gauge‡ (Pikdare S.p.A.)

*The present surgical technique could be used with any all-inside repair system.

†The unique feature of the Tuohy needle is that at the end of the needle, it has a directional tip that allows the surgeon to direct the injection needle as it exits the needle tip.

‡It is important that the injection needle is smaller in diameter and longer than the epidural sleeve so it can be inserted within it.

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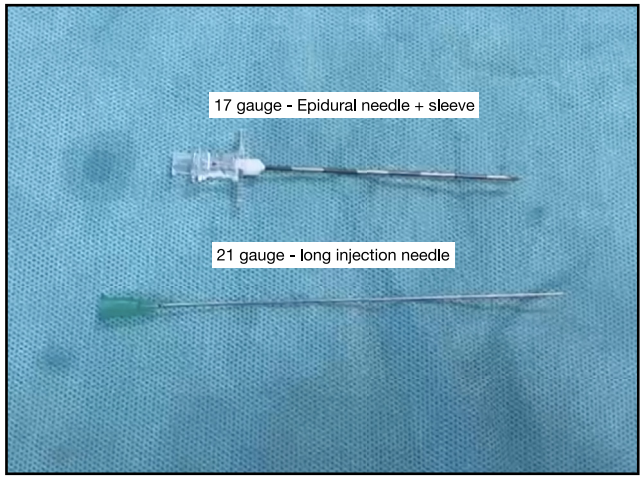

Fig 1. Equipment needed for the surgical technique.

portal is created first, followed by an anteromedial portal under direct arthroscopic visualization.[6] The leg is placed in the figure-of-4 position and the lateral meniscus is addressed. At least 90° of knee flexion has been advisable to limit the risk of popliteal artery injury during lateral meniscus repair.[7] Table 1 shows the specific equipment required for our technique (Fig 1).

Before proceeding to the all-inside repair, maintaining the scope in the anteromedial portal, the epidural needle is introduced through the anterolateral portal until it reaches the meniscal lesion (Fig 2). Subsequently, the injection needle is inserted through the sleeve of the epidural needle to stabilize the meniscal tear (Video 1). Once the meniscal tear is reduced, the all-inside meniscal repair system is introduced. After deploying the first anchor, the needle inserter is withdrawn from the meniscus but maintained in the joint. The second anchor is advanced to the tip of the inserter, which is then advanced across the meniscus a second time and deployed (Fig 3). The anchors and resultant

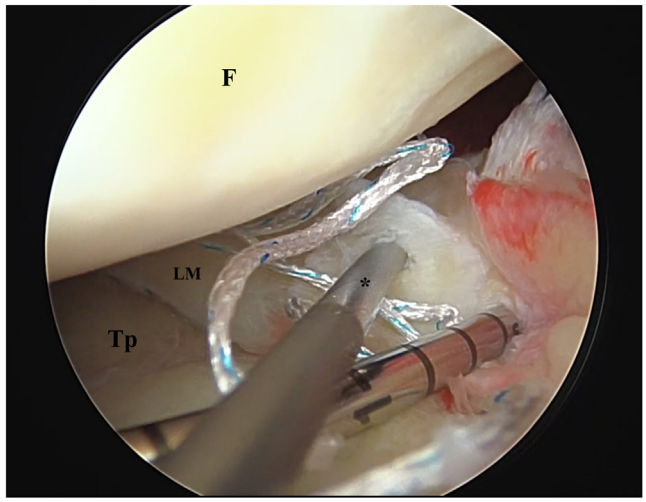

Fig 3. Right knee in figure of 4 position. Scope in anteromedial portal and all-inside system in anterolateral portal. The all-inside system is inserted within the meniscus to deploy the second anchor for a horizontal suture. The epidural sleeve and injection needle (*) are used to maintain reduction of meniscal tear. (F, femoral condyle; LM, lateral meniscus; Tp, tibial plateau.)

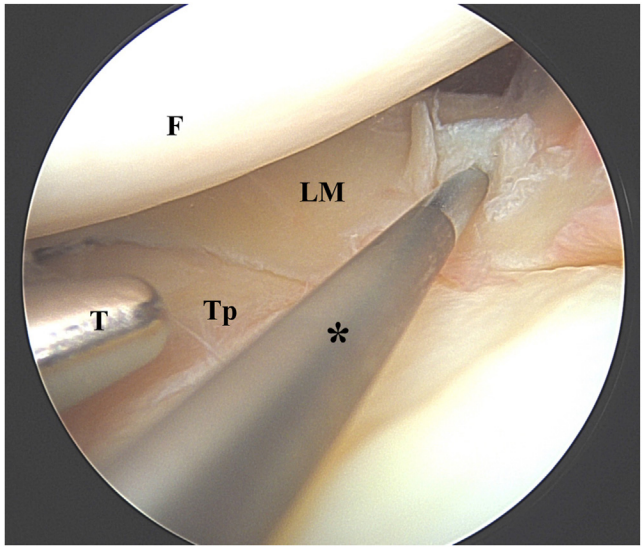

Fig 2. Right knee in figure of 4 position. Scope in anteromedial portal and trocar in anterolateral portal. The injection needle is inserted within the epidural sleeve to maintain the reduction of meniscal tears. *Epidural sleeve and injection needle. (F, femoral condyle; LM, lateral meniscus; T, trocar; Tp, tibial plateau.)

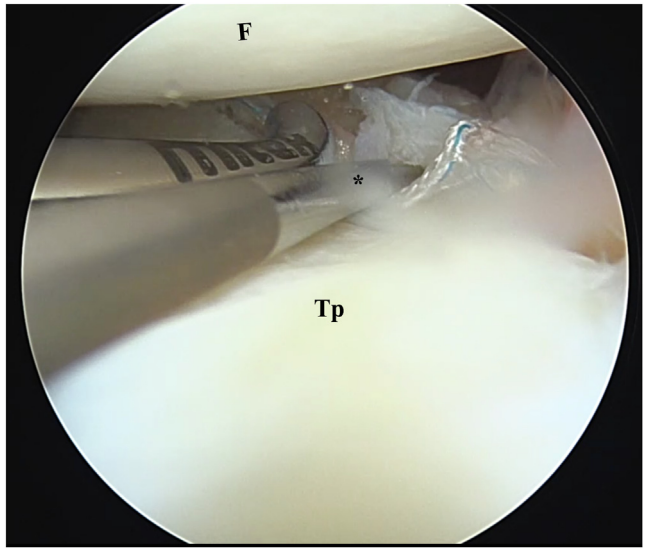

Fig 4. Right knee in figure of 4 position. Scope in anteromedial portal and knot-pusher in anterolateral portal. The epidural sleeve and injection needle (*) are used to maintain reduction of meniscal tear during tying knot of all-inside system. (F, femoral condyle; Tp, tibial plateau.)

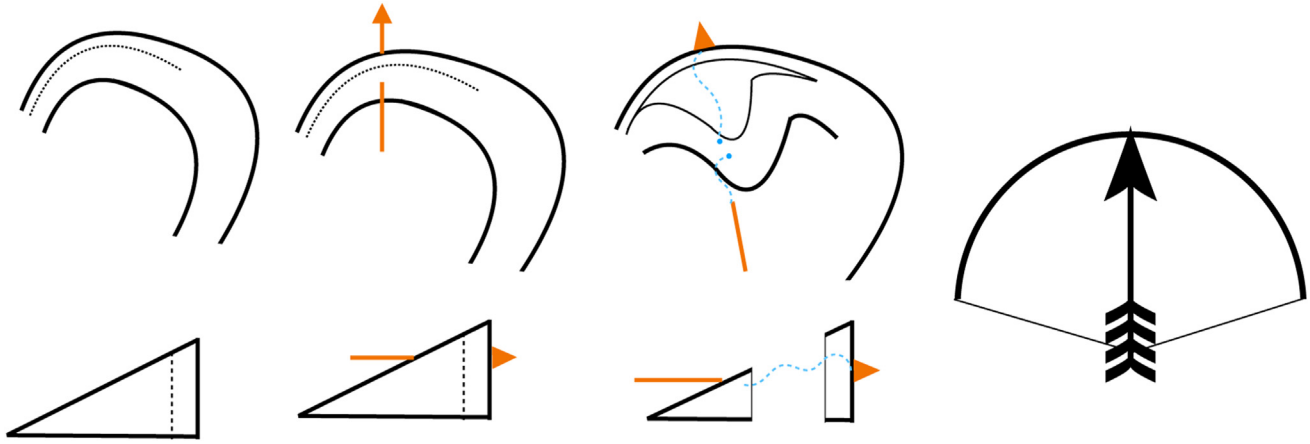

Fig 5. Bow effect. The first row shows the axial view of the meniscal tear. The second row shows the sagittal view of the tear. A longitudinal tear is represented with a dotted line. Fast-Fix 360° meniscal repair is represented by an orange arrow. The first anchor of the all-inside device is represented by the head of the orange arrow. Blue dotted line: nonabsorbable suture of all-inside repair.

Table 2. Limitations

If the quality of the meniscal tissue is low (chronic tear), the sleeve of the epidural needle could pass through the meniscal tissue.
One needle might not be sufficient to maintain a reduction.
The surgeon should be aware to not deepen the injection needle in meniscal tissue to limit the risk of vascular nervous injuries (especially for lateral meniscal repair).

Table 3. Pearls and Pitfalls

Pearls	Pitfalls
The injection needle could be used to make a microperforation on the meniscal wall to improve healing of meniscal repair	Difficult to use in case of poor quality of tissue
The injection needle and sleeve could be inserted in the same portal of scope	The needle could be cumbersome
More injection needles could be used to allow reduction of the meniscal tear	Caution should be used for repairing the posterior horn of the lateral meniscus to avoid injuries to popliteal vessels and/or sciatic nerve

Table 4. Advantages and Disadvantages

Advantages	Disadvantages
Cheap and reproducible	Risk of vasculonervous injury (especially for lateral meniscus repair)
Low-demanding technique	Breakage of injection needle*
Anatomic reduction of meniscal tear	Chondral damage during insert injection needle, especially with improper visualization
Easier meniscal repair	

*Never happened in our experience.

suture bridge may be placed in a vertical or horizontal mattress configuration. The injection needle might be maintained within the meniscus to stabilize the tear during tying the knot (Fig 4). The epidural and injection needle are removed at the end of the suture.

Discussion

To repair as much of the meniscus as possible, it is mandatory to achieve a stable reduction of the meniscal tear. However, we have to carefully consider that after deploying the first anchor of the all-inside device, the meniscal flap could dislocate in the notch (bow effect, Fig 5), making the repair even more challenging. It is known that a stable reduction is fundamental to achieving a satisfactory meniscal repair. A stable reduction is defined if there is no gap between the torn edges and no instrument is required to maintain reduction.[8] However,

especially in the case of chronic tear, the torn segment could be dislocated; therefore, the arthroscopic probe should be used to reduce it, moving it out of the intercondylar notch and exerting constant pressure on the torn segment. The problem is that the arthroscopic probe could be cumbersome, precluding the surgeon from using an arthroscopic access for the meniscal repair device. In the present article, we report how an epidural sleeve with an injection needle could be used in case of all-inside repairs to maintain the reduction of meniscal tears. In our experience, the present technique could be used with any type of meniscal tear (i.e., parrot beak, longitudinal, bucket handle, radial) for both medial and lateral meniscus. Moreover, it could be used for all-inside or outside-in repair, and the surgeon could change the direction of the needle during the repair. Limitations of the technique are reported in Table 2. Pearls and pitfalls, as well as advantages and disadvantages, of the technique are reported respectively in Tables 3 and 4. This is an easily reproducible approach to maintain the reduction of meniscal fragments before repair.

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Disclosures

The authors report no conflicts of interest in the authorship and publication of this article. Full ICMJE author disclosure forms are available for this article online, as supplementary material.

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