Technical Note

Outside-In Repair of Longitudinal Tear of Medial Meniscus: Suture Shuttle Technique

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Abstract: Meniscal tears are commonly encountered conditions of the knee. In the past, torn menisci were treated by excision of the loose flap. A better understanding of the meniscus anatomy and its biomechanical characteristics has led to the concept of meniscus preservation in eligible cases. Several suture-based repair techniques have been described in literature, including the outside-in technique. Although the outside-in technique of meniscus repair is commonly indicated for the anterior two-thirds of the meniscus, it can be used to repair the posterior part of the meniscus as well. Several modifications of this technique have been described in the literature. We hereby describe our modification of the outside-in technique of meniscus repair with the help of an epidural needle and high-strength sutures that is readily available in operating rooms. The advantages of our technique are that no large incision is required around knee joint, it's inexpensive, it can be performed with basic instruments, and even the tear of meniscus extending up to the posterior horn can be repaired. A supplemental video demonstration of the technique is included with this article.

Introduction (With Video Illustration)

Meniscus tears are common knee injuries treated by orthopaedic surgeons. Menisci were considered a vestigial remnant of leg muscle in the past, and excision used to be the only treatment for torn menisci.[1] At present, there is enough evidence available to conclude that meniscal resection leads to increased incidence of knee arthritis as a result of increased contact stresses between the articulating surfaces. Therefore, the focus of treatment has shifted from meniscectomy to meniscal preservation.[1-3] Annandale, in 1883 AD, first described the meniscus repair surgery, and since then it has evolved in terms of techniques with multiple modifications.[1,3] Site, size, and type of the meniscus tear are the main determinants for repairability. Several repair techniques have been described in literature, which can be grouped into the following 4 techniques: inside-out repair, outside-in repair, all-inside repair, and the hybrid technique of meniscal repair.[4]

The outside-in meniscal repair technique is the most economical one and can be performed with the basic instruments that are readily available in operating rooms.[4] In this technique, suture material is passed from outside the joint into the torn meniscus and retrieved back to the exterior after repairing with various configurations. Following the retrieval, the 2 free ends are then tied over capsule to make a knot. Several authors have given their own modification for this technique.[4-7] Many of these techniques use large skin incisions to reach the capsule. Some surgeons use 2 needles to pass the sutures, whereas others have described complex intra-articular maneuvers of suture passing.[4-8] Although all these techniques have reported good outcomes, we encountered difficulty in maneuvering the needles and sutures inside the joint while replicating these techniques. Also, it is technically more demanding. We hereby report our modification of outside-in meniscus repair technique, which avoids a large incision in the skin and has lesser intra-articular manipulation of sutures and needles (Video 1). The indications for this technique are

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Table 1. Indications and Contraindications of the Outside-in Suture Shuttle Technique

Indications	Contraindications
1. Longitudinal tear of medial meniscus irrespective of size.	1. Complex tear of meniscus.
2. Horizontal tears of medial meniscus.	2. Tear exclusively in white zone.
3. Tears located in red-red or red-white zone.	3. Patients older than 40 years.
4. Patients younger than 40 years of age.	4. Meniscal tear with Kellgren and Lawrence[8] grade III or more osteoarthritic changes in the same compartment.
5. Meniscal tears of stable knees (reconstructed or intact ligaments).	5. Meniscal tear in unstable knee.
6. Longitudinal or horizontal tear of Lateral meniscus, anterior to popliteal hiatus.	6. Tear of lateral meniscus posterior to popliteal hiatus.

summarized in Table 1.[8] The instruments and materials required for outside in meniscal repair are listed in Table 2 and are demonstrated in Figure 1.

Surgical Technique

The overall procedure is depicted in the flowchart in Figure 2.

Patient Positioning and Diagnostic Arthroscopy

The patient is placed in supine position, and the injured leg is prepped and draped, maintaining sterility. A tourniquet is applied to the upper thigh and the lower limb is positioned in 45° of hip flexion and 90° of knee flexion using a lateral post and a foot support (Fig 3A). The operative procedure requires a minimum of 3 surgeons. The main surgeon stands on the operative side of the patient along with the second assistant, who manipulates the limb. The first assistant stands across the table on the opposite side and performs the extra-articular work of this technique, such as suture shuttles and knot tying (Fig 3B).

Before diagnostic arthroscopy, examination under anesthesia is performed. Arthroscopy is done through standard anterolateral and anteromedial portals. A careful evaluation of the tear site, size, and type is performed to determine the repairability of the tear. In case of inadequate visualizations of the periphery of the meniscus, pie-crusting of superficial medial collateral ligament is done using a 16-G intravenous cannula (Vasofix intravenous cannula; B. Braun) in 30° of knee flexion with valgus stress applied to the knee (Fig 4). Once the medial joint is adequately exposed and the entire periphery of the meniscus is visualized, the tear is reassessed for repairability (Fig 5).

Table 2. List of Instruments and Materials Required for Outside-in Meniscal Repair

Instruments and Materials Type	Manufacturer
Standard arthroscopy equipment	Karl Storz, Tuttlingen, Germany
Arthroscopic probe	ACUFEX; Smith & Nephew, Andover, MA
16-G intra venous cannula	Vasofix intravenous cannula; B. Braun, Melsungen AG, Germany
Diamond rasp	ACUFEX; Smith & Nephew Smith & Nephew
Arthroscopic cannula	B. Braun
180-G Tuohy epidural needle	Ethicon, J&J Medical Devices, Somerville, NJ
No. 1 Prolene	Smith & Nephew
Orthocord	J&J Medical Devices
Arthroscopy grasper and cord cutter	Smith & Nephew

Meniscal Preparation

After assessment of the extent of tear in meniscus and its repairability, the peripheral rim of the meniscus is shaved with an arthroscopic shaver without suction. Any loose fragment attached to the central or peripheral rim of meniscus is removed. The torn edges of meniscus are rasped using a diamond rasp (ACUFEX; Smith & Nephew) to create a bleeding peripheral rim (Fig 6).

After preparing the meniscus, an arthroscopic cannula (Smith & Nephew) is inserted into the joint through the anteromedial portal for smooth and unobstructed suture management during repair (Fig 7).

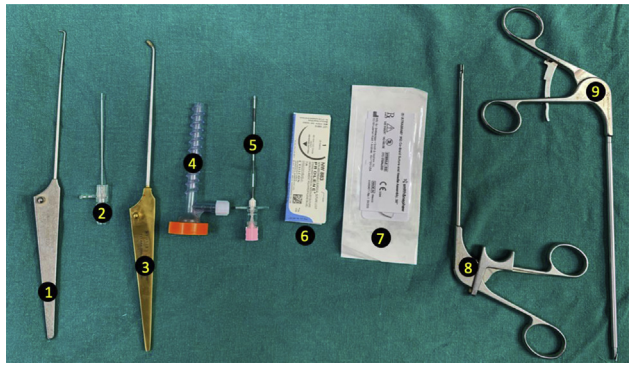


Fig 1. Basic instruments and materials required for outside-in meniscal repair. (1) Arthroscopic probe (ACUFEX; Smith & Nephew, Andover, MA), (2) 16-G intravenous canula (Vasofix intravenous cannula; B. Braun, Melsungen AG, Germany), (3) Diamond rasp (ACUFEX; Smith & Nephew), (4) Arthroscopic canula (Smith & Nephew), (5) 18 G-Tuohy epidural needle (B. Braun), (6) No. 1 Prolene (Ethicon, J&J Medical Devices, Somerville, NJ), (7) Orthocord (J&J Medical Devices), (8) Arthroscopy Grasper (ACUFEX; Smith & Nephew), (9) Cord cutter (Smith & Nephew).

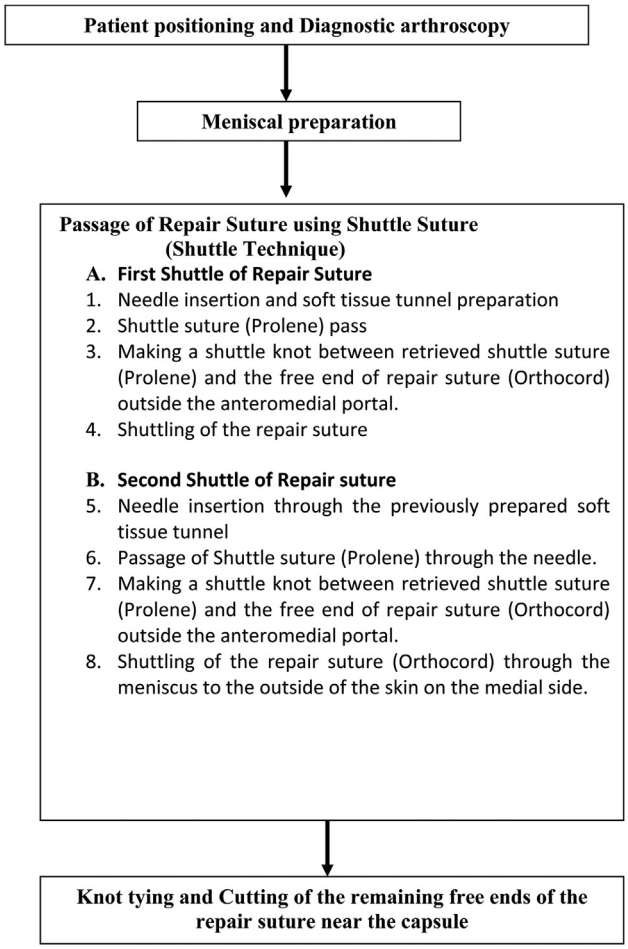


Fig 2. Flow chart showing the steps of meniscal repair.

Suture Passage

We use 2 suture materials in our technique; a shuttle suture and a repair suture. The shuttle suture is No. 1 Prolene (Ethicon, J&J Medical Devices), which is passed through the epidural needle and is used to shuttle the repair suture. The repair suture is No. 2 Orthocord (J&J Medical Devices), which will be used for repair of the meniscus. In this technique, the application of one repair stitch in the meniscus requires 2 sequential shuttles of sutures, which is described in sections to follow.

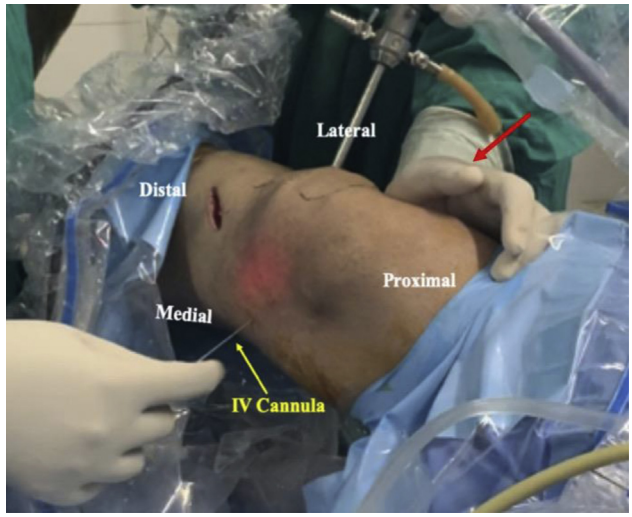


Fig 4. A right knee is shown. A 16-gauze intravenous cannula (I/V) (yellow arrow) is used for pie-crusting of superficial medial collateral ligament. The knee is flexed to 15 to 30° and valgus force is applied by the second assistant (red arrow).

First Shuttle of Repair Suture (Steps 1-4)

Step 1: Needle Insertion and Soft-Tissue Tunnel Preparation

A standard 18-gauze Tuohy epidural needle (B. Braun) is passed through the skin into the medial compartment of the knee joint with the help of the transillumination. Transillumination also helps to avoid any venous punctures, as it makes the venous markings prominent. Once the needle pierces the capsule and comes into the joint, it is advanced further to pierce through the superior surface of

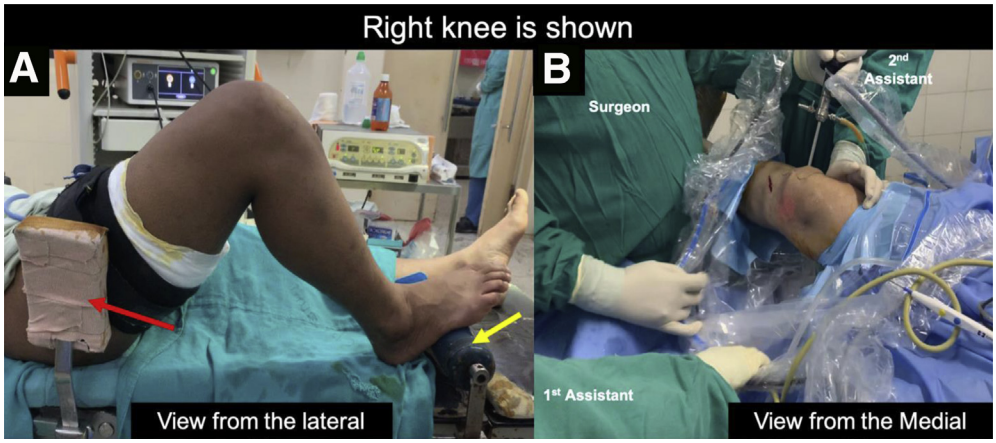


Fig 3. A right knee is shown. (A) Picture showing the position of the leg maintained by a lateral post (red arrow) and a foot support (yellow arrow). This is our preferred position of limb in knee arthroscopy surgery (B) Positions of the 3 surgeons during meniscal repair procedure.

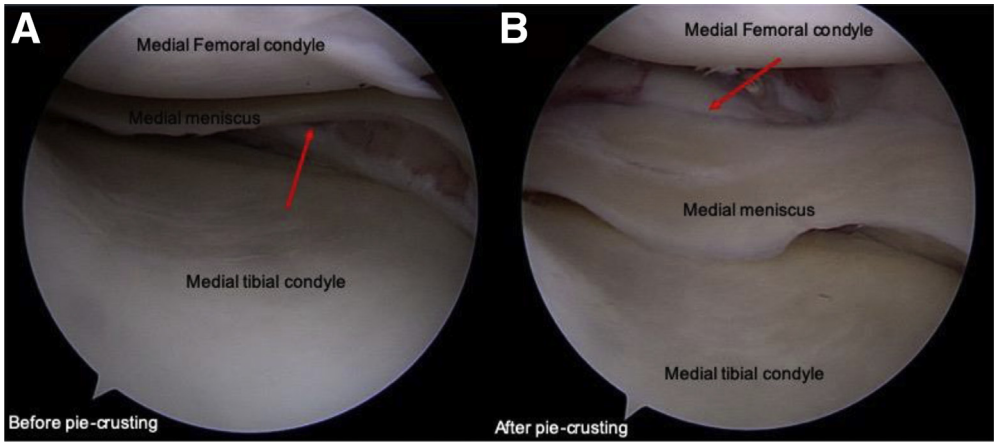


Fig 5. A right knee arthroscopic view of medial compartment through anterolateral portal is shown. (A) Medial compartment of the knee before pie-crusting; the red arrow indicates the tear visible through the inferior surface of the meniscus. (B) Medial compartment of the knee after pie-crusting of superficial medial collateral ligament; the red arrow shows longitudinal tear of medial meniscus. The tear extent and characteristics are seen more clearly after pie crusting.

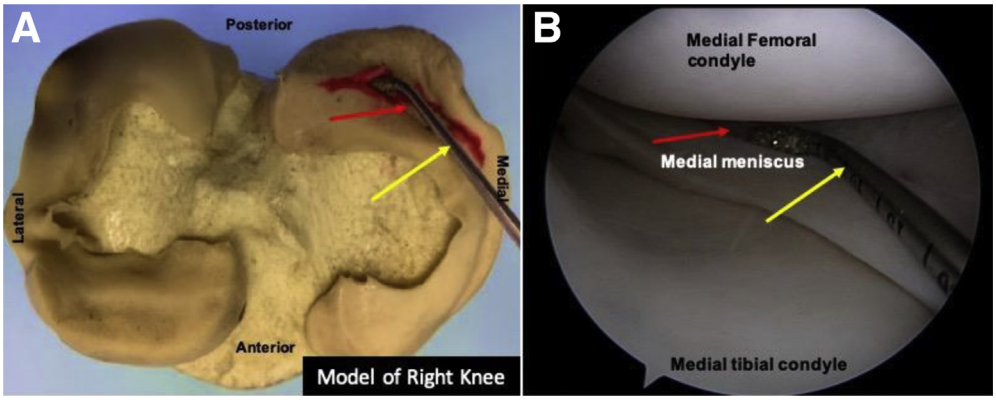


Fig 6. (A) A model of right knee simulating a longitudinal tear in the medial meniscus (red arrow) that is being abraded by a diamond rasp at the peripheral rim (yellow arrow). (B) Arthroscopic view of the medial compartment of the right knee showing the longitudinal tear of medial meniscus (red arrow) and a diamond rasp (yellow arrow) being used to abrade the peripheral rim of the meniscus.

central flap of torn meniscus such that the end of needle comes out from inferior surface (Fig 8). The advantage of using an epidural needle over spinal needle is the gentle curvature at its end, which helps to take a desired bite of the meniscus by manipulating the tip of the epidural needle in different directions. The arthroscopy probe can be used to stabilize the central flap of the torn meniscus during the needle insertion.

Once the desired bite is taken into meniscus, a stab incision is made in the skin, at the entry point of the epidural needle, with a No. 11 surgical blade (Fig 9A). A curved hemostat is then used to deepen the stab incision up to the capsule and widen the incision to create a soft-tissue tunnel extending between the skin and the capsule (Fig 9B).

Step 2: Shuttle Suture (No. 1 Prolene, Ethicon, J&J Medical Devices) Pass

After the soft-tissue tunnel is created, No. 1 Prolene is passed through the epidural needle into the joint

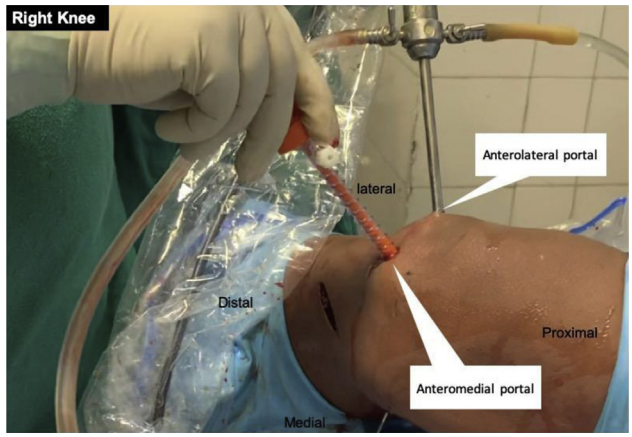


Fig 7. A right knee is shown. The figure shows arthroscope inserted through the anterolateral viewing portal and an arthroscopy cannula, which is being inserted into the anteromedial portal. The surgeon is standing on the foot end of the table and facing the head end.

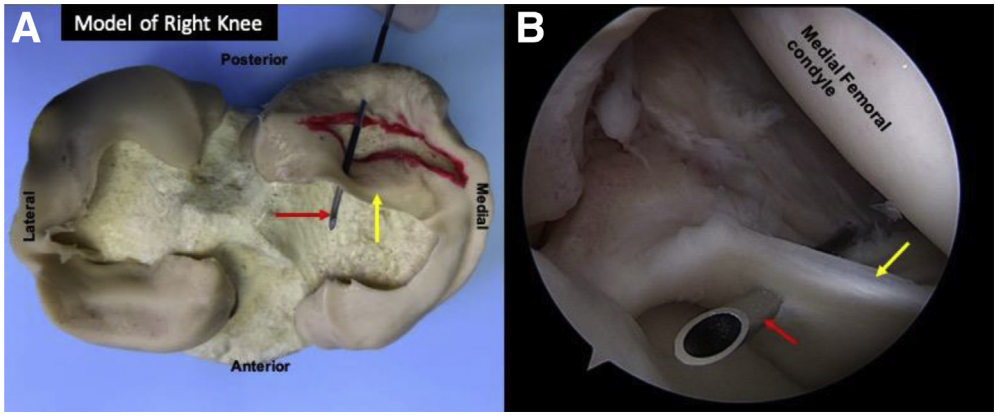
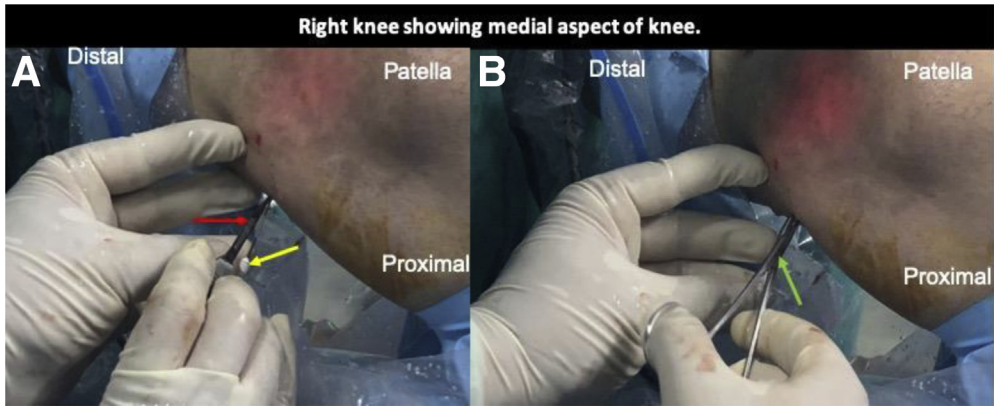


Fig 8. (A) A model of the right knee simulating longitudinal tear in the medial meniscus. The epidural needle (red arrow) is passed from superior to inferior surface of the torn central flap (yellow arrow) of the medial meniscus. (B) Arthroscopic view of the medial compartment of the right knee showing epidural needle (red arrow) being passed from superior surface and exiting through the inferior surface of the central flap of the medial meniscus (yellow arrow).

Fig 9. A right knee is shown. (A) A stab incision is given with a No. 11 surgical blade (red arrow) in the skin at the insertion point of the epidural needle (yellow arrow), (B) a curved hemostat (green arrow) is used to create a soft tissue tunnel between the skin and the capsule.



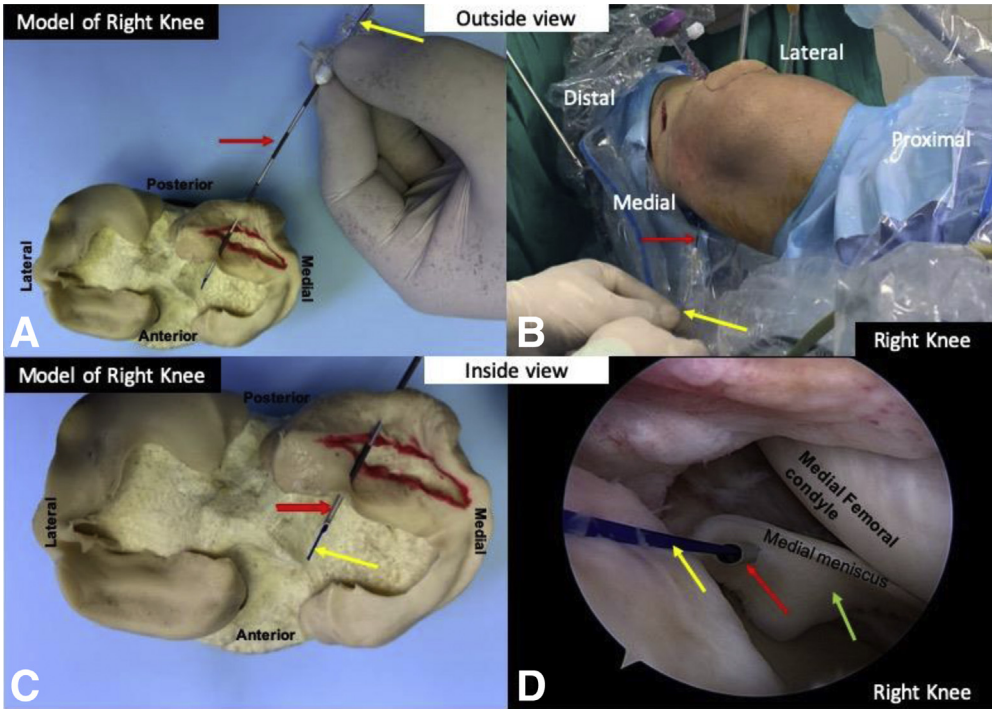


Fig 10. (A) A simulation model of a right knee showing the epidural needle (red arrow) piercing the meniscus and a No. 1 Prolene (yellow arrow) being passed from outside-in. (B) A right knee is shown with the epidural needle (red arrow) being inserted and the first assistant inserting the Prolene through the epidural needle (yellow arrow). (C) The interior of a right knee model with the epidural needle (red arrow) and the Prolene (yellow arrow) being passed through the central flap of torn meniscus. (D) Arthroscopic view of a right knee showing the epidural needle (red arrow) piercing the meniscus (green arrow) and the tip directed towards the notch to pass the Prolene (yellow arrow) toward the notch area.

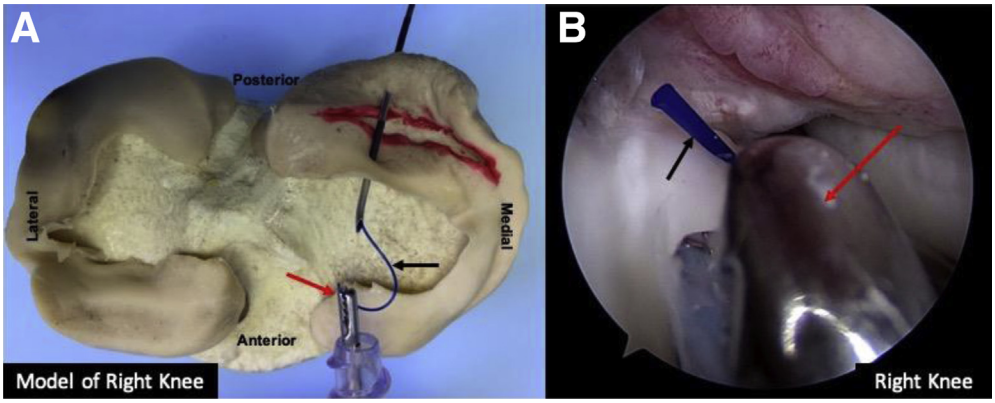


Fig 11. (A) A model of right knee is shown. An arthroscopic grasper (red arrow) is introduced through the cannula placed in the anteromedial portal and the Prolene (black arrow) is grasped and retrieved through the anteromedial portal. (B) Arthroscopic view of steps described in Fig 10A (red arrow: grasper; Black arrow: Prolene parked in the notch).

(Fig 10 A and B). Prolene is used as shuttle suture because of its stiffness, which makes it easy to pass against the water flow coming out through the lumen of epidural needle (Fig 10 C and D).

The tip of the shuttle suture is parked in the intercondylar notch area for easy grasping. This can be facilitated by rotating the curved tip of the epidural needle to face the anterior part of the knee. Alternatively, an arthroscopy probe can be used to facilitate the passage of suture toward the intercondylar notch area of the joint.

Step 3: Making a Shuttle Knot

An arthroscopic grasping forceps is introduced through the cannula in anteromedial portal, and the Prolene is grasped and retrieved out of the joint through the cannula (Fig 11 A and B). A repair suture (No. 2 Orthocord; J&J Medical Devices) is then manipulated to form a loop at one end. The end of Prolene that was retrieved from the joint through anteromedial portal is then passed through the loop of the Orthocord, and a tight simple knot is made over the loop of repair suture (Fig 12 A and B).

Step 4: Shuttling of the Repair Suture (Orthocord)

Once the knot is secured into the loop of the Orthocord, the epidural needle and Prolene is pulled outside the skin through the previously prepared soft-tissue tunnel. The epidural needle is then disengaged from the Prolene. The knot is pulled inside the joint through the anteromedial portal with a slow and steady pull of the Prolene. Once the knot reaches the central flap of the medial meniscus, a jerk is applied to retrieve the knot outside the skin through the soft-tissue tunnel (Fig 13 A-E).

Second Shuttle of Repair Suture

Step 5: Needle Insertion Through the Previously Prepared Soft-Tissue Tunnel

For the second pass, the same epidural needle is inserted through the previously prepared soft tissue tunnel into the joint (described in Step 1). Once the needle is visualized inside the joint arthroscopically, the direction of passage of the needle through the torn central flap of meniscus has to be decided. To achieve a vertical mattress configuration, the needle has to be inferior to the meniscus, without piercing

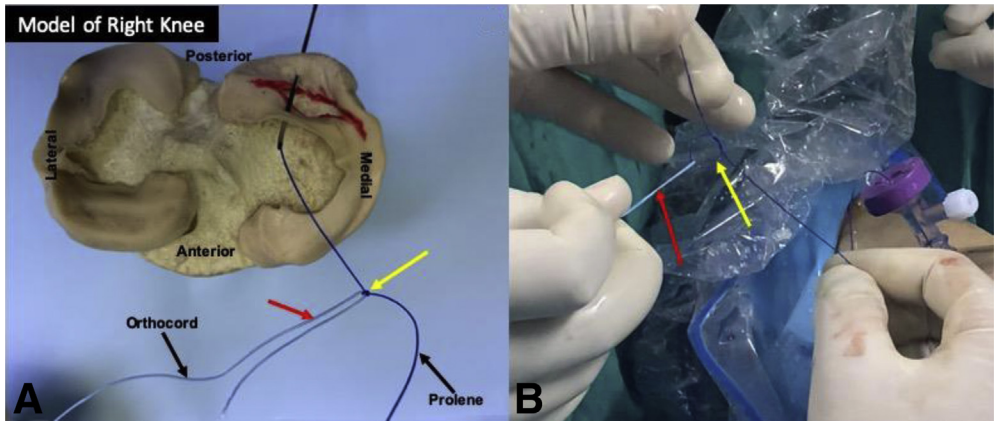


Fig 12. A model of a right knee showing the Prolene (black arrow) being retrieved out and a simple knot (yellow arrow) being made over the loop of the Orthocord (red arrow). (B) The intraoperative picture showing tying of a simple knot with the Prolene (yellow arrow) across the loop of Orthocord (red arrow).

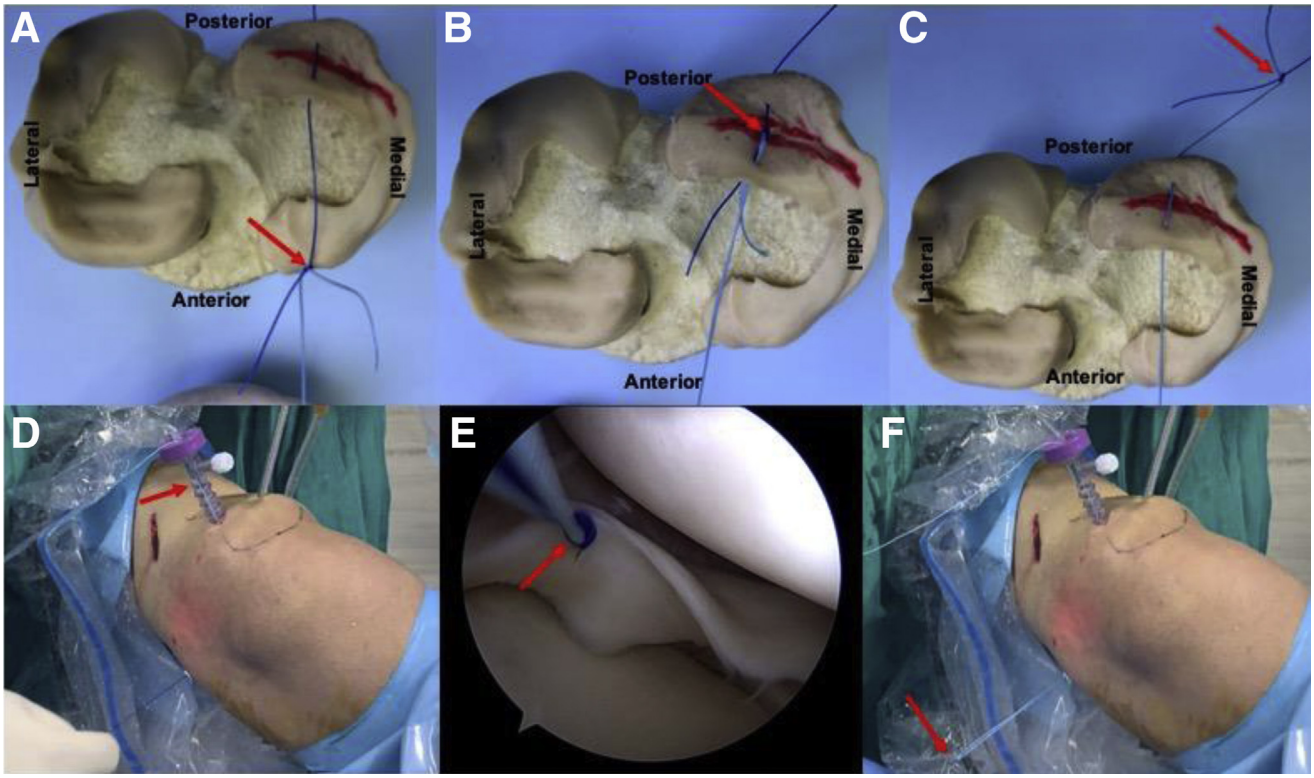


Fig 13. (A-C) A simulation model of the right knee showing various steps of shuttling (sequential change in position of the red arrow) of Orthocord using Prolene. (A) knot placed outside the joint and passing through the cannula. (B) Knot being passed inside the joint. (C) Knot pulled out across the meniscus to the medial aspect through the soft tissue tunnel. (D-E) shows operative view of the shuttling of sutures; sequential positioning of the knot is shown by the red arrow. (D) The position of the knot outside the joint in the anteromedial portal. (E) The arthroscopic view of the positioning of the knot before being pulled out of the central flap of the meniscus. (F) The position of the knot outside the medial aspect of knee after being pulled out through the meniscus and the capsule.

the central flap of meniscus (Fig 14). In cases in which a horizontal mattress is desirable, the second passage of needle has to be from the superior surface of the torn flap of meniscus. For the purpose of demonstration in this Technical Note, we are using a vertical mattress suture as reference.

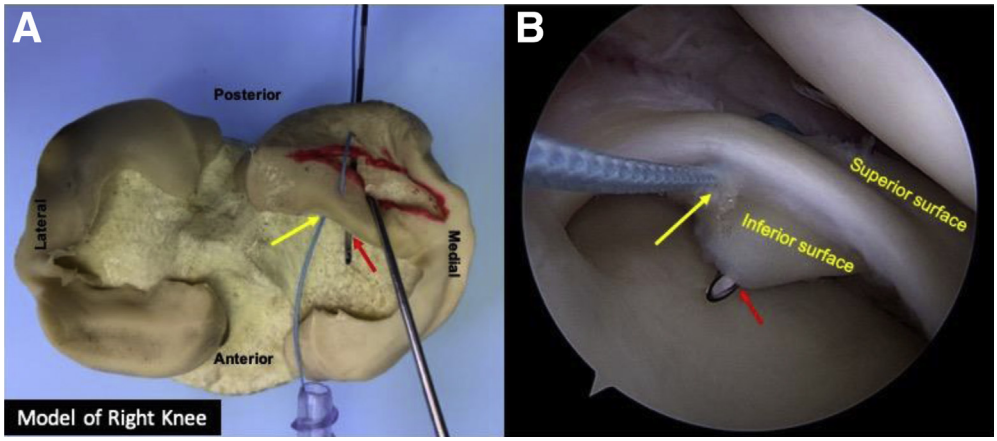


Fig 14. (A) A model of right knee simulating the passage of epidural needle from underneath the meniscus (red arrow), and the Orthocord being passed from the superior to inferior surface of the torn meniscus (yellow arrow). (B) Arthroscopic view of a right knee showing the Orthocord being passed from the superior to inferior surface of the torn flap of medial meniscus (yellow arrow), and the epidural needle being passed into the joint underneath the meniscus (red arrow).

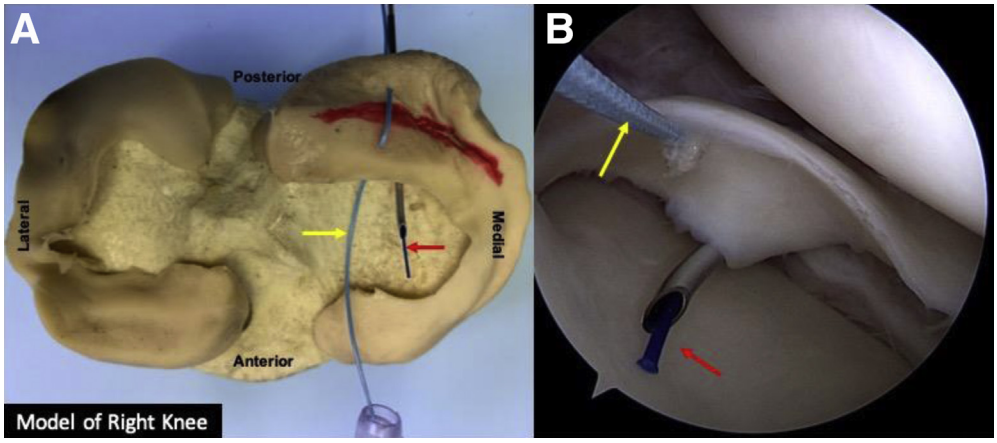


Fig 15. (A) A model of a right knee showing Orthocord of from first shuttle (yellow arrow) and Prolene from passage of second shuttle (red arrow) through the lumen of epidural needle. (B) Arthroscopic view of a right knee showing Orthocord from first shuttle of sutures (yellow arrow), and Prolene from second passage exiting underneath the meniscus through lumen of epidural needle (red arrow).

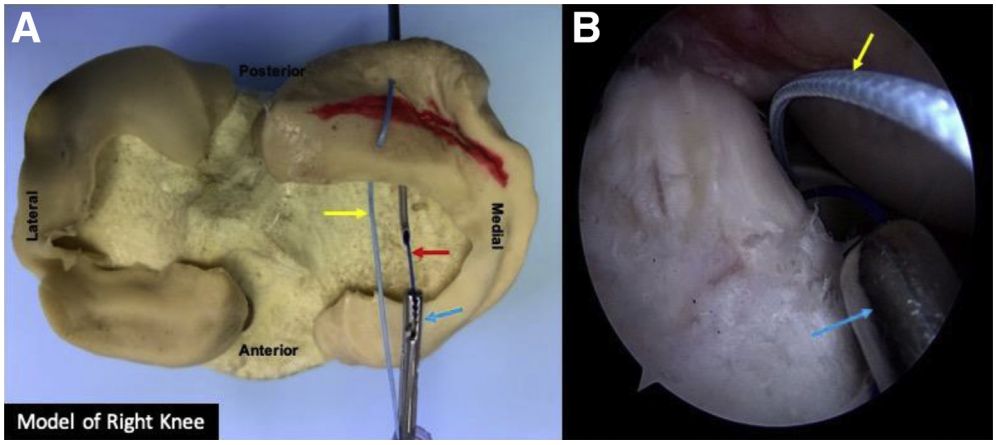


Fig 16. (A) A model of a right knee showing Orthocord (yellow arrow) passed from first shuttle, and the Prolene from second shuttle (red arrow) being grasped with an arthroscopic grasper (blue arrow). (B) Arthroscopic view of a right knee showing the process from (A); Orthocord (yellow arrow) and grasper (blue arrow).

Step 6: Passage of Shuttle Suture (Prolene) Through the Needle

Once the correct passage of epidural needle into the joint (underneath the meniscus) is assured, the same Prolene is passed through the lumen of epidural needle into the joint similar to the maneuver mentioned in Step 2 (Fig 15). The tip of the Prolene is again parked in the intercondylar notch area for easy grasping.

Step 7: Making a Shuttle Knot Between Repair and Shuttle Sutures

An arthroscopic grasping forceps is introduced through the cannula placed in the anteromedial portal, and the Prolene is grasped and retrieved out of the joint, similar to Step 3 (Fig 16). The free tail of the Orthocord is looped again, and the end of the Prolene is passed through the loop to form a tight simple knot similar to Step 3 (Fig 17).

Step 8: Shuttling of the Repair Suture (Orthocord)

Once the knot is secured into the loop of the Orthocord, the epidural needle and the Prolene is pulled out

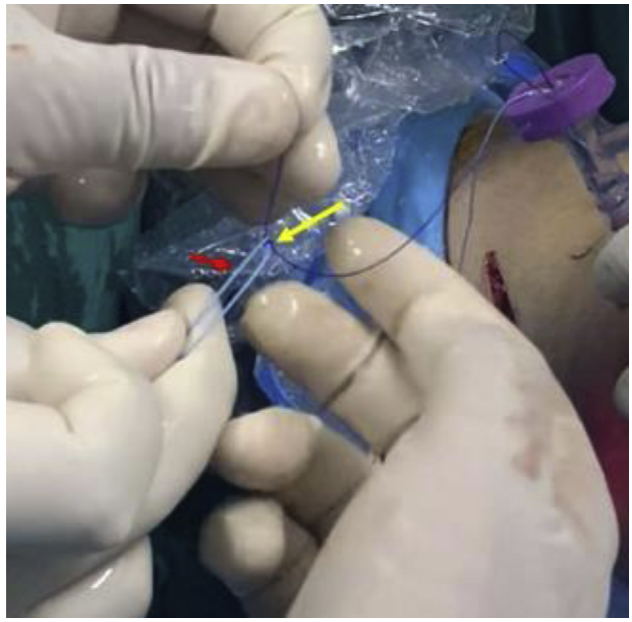


Fig 17. Tail of Orthocord from first shuttle passage (end exiting from the anterolateral portal is looped (red arrow), and a simple knot is made with the Prolene (yellow arrow).

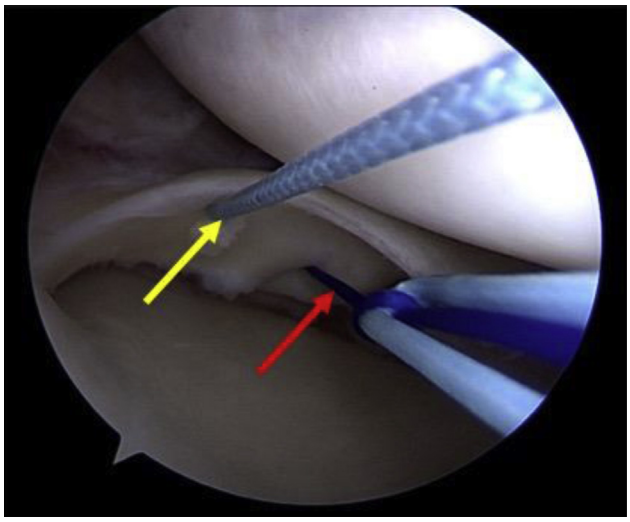


Fig 18. The arthroscopic view of a right knee is shown. The yellow arrow points to Orthocord from first shuttle, and the red arrow points to the Prolene pulling on the second tail of the Orthocord passing from the anteromedial portal.

of the skin in the similar fashion described earlier in Step 4. Once the knot reaches up to the meniscus, a jerk is applied to retrieve the knot outside the skin on the medial aspect of knee (Fig 18).

Once both the tails of the Orthocord are retrieved out on the medial side of the knee, a gradual pull on one of the limbs of the repair suture is given. Once a loop of the repair suture is visible inside the joint (Fig 19 A and B), an arthroscopic probe is then inserted through anteromedial portal to hook the loop (Fig 19 C and D) to prevent cutting through the meniscus while pulling the suture.

Based on the length of the tear, several repair sutures can be placed 3 to 4 mm apart, in similar fashion, to repair the entire length of the meniscus tear. The same stab incision can be used to pass another adjacent suture if it can be aligned vertical to the meniscus. If the needle has to be introduced from a separate site in an attempt to place suture vertically, a separate stab incision has to be given again at the entry site similar to Step 1, and a soft-tissue tunnel has to be created for suture passage and shuttling. Steps 1 to 8 have to repeated to apply several sutures across the torn meniscus.

Knot Tying and Cutting of the Remaining Free Ends of the Repair Suture Near the Capsule

Once all sutures limbs are retrieved through the same or separate stab incisions on the medial aspect of the knee, knot tying is performed starting from the posterior most repair suture. The complimentary limbs of the repair suture are pulled alternately in order to determine the post and loop limb of the Orthocord. While doing so, an arthroscopy probe is inserted into the loop of the Orthocord to prevent cut-through of the meniscus. The limb that restores the meniscal reduction while pulling is made post and the other is made the loop. A Samsung Medical Center (SMC) knot is then made, and the post

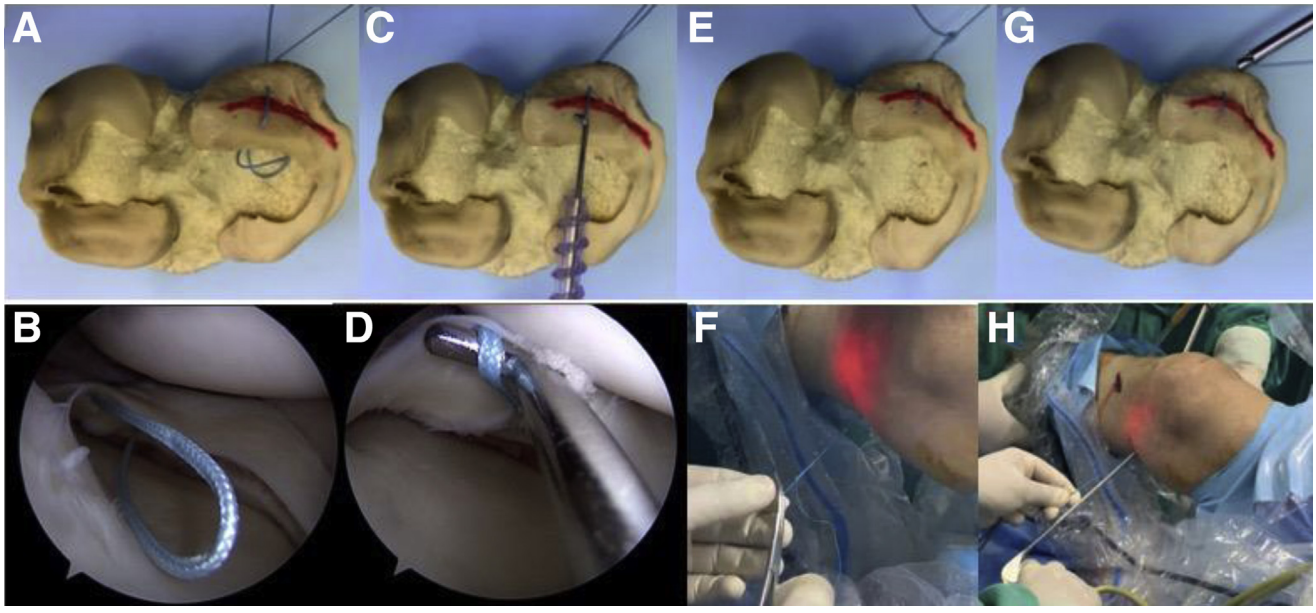


Fig 19. The process of knot tying is shown in a simulation model and with intraoperative pictures. (A) A right knee model showing the loop of Orthocord inside the joint. (B) Arthroscopic view showing the loop of Orthocord inside the joint. (C) A knee model simulation showing an arthroscopic probe being used to reduce and prevent the cutting of meniscus during suture pulling. (D) Arthroscopic view showing the use of probe during pulling of the Orthocord. (E) Sliding SMC knot being tied outside the joint on the knee model, (F) surgical picture of SMC knot being tied. (G) A cord cutter being used to cut both limbs on a simulation knee model(H) The surgical picture showing the use of cord cutter to cut the free ends of the repair suture inside the soft tissue tunnel after forming the knot. (SMC, Samsung Medical Center.)

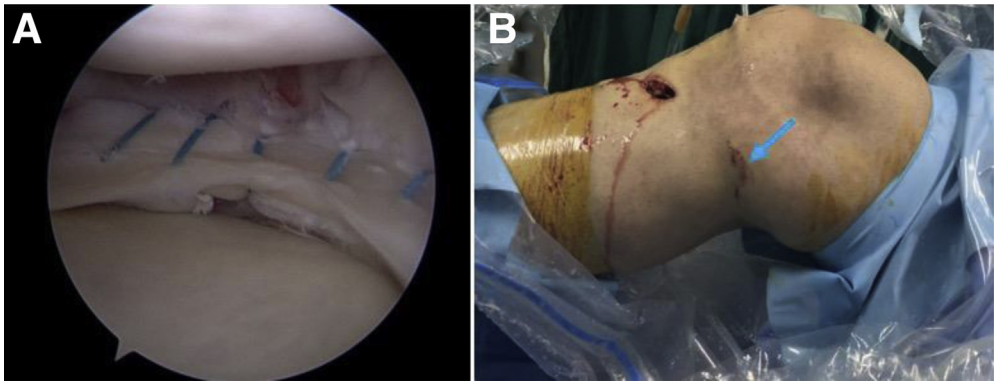


Fig 20. (A) Arthroscopic view of final repair of the bucket handle tear of the medial meniscus, (B) A stab incision (blue arrow) is seen on the medial aspect of a right knee.

limb is pulled to slide the knot through the soft-tissue tunnel on to the capsule (Fig 19 E and F). During this entire process, the meniscus is visualized and probed repetitively to keep the meniscus adequately reduced. Once all knots are tied, they are cut using a cord cutter (Smith & Nephew) near the capsule (Fig 19 F and G).

The final repair of meniscus is shown in Fig 20A. Stab incisions do not need suturing (Fig 20B), as they are very small and heal within 10 days.

Discussion

Meniscus repair is the treatment of choice for torn meniscus in present day.[1-3] This paradigm shift from excision to repair of meniscus is because of a better understanding of the role of meniscus in knee biomechanics. Many repair techniques have been described in literature.[4-7] The all-inside technique has good outcomes, but the use of this technique is limited due to high cost and occasional neurovascular complications.[3,9,10] The inside-out technique is an alternative technique, but it requires specialized needles and cannulas, and this technique invariably requires large safety incisions. The outside-in technique overcomes these limitations of high cost, specialized instruments, and a large scar, but its use is limited to anterior meniscus tears only.[3,4] There are few reports of its use even in the posterior third tears of meniscus, but they require large incisions around the knee and/or complicated intra-articular maneuvers of needles and instruments.[11]

The aforementioned technical note describes our modification of the outside-in meniscal repair technique, which we have named the "suture shuttle technique." In our technique, 2 sutures are used; Prolene as a shuttle suture, which pulls the repair suture (Orthocord) along with it, and a repair suture (Orthocord) for final repair of the meniscus. We use an epidural needle in our technique to pass the shuttle sutures. The advantage of the epidural needle is that its gentle curvature at the tip helps in correct placement of suture into the meniscus. Our technique avoids a large incision around the knee, which may potentially cause stiffness. We create a soft-tissue tunnel through a stab incision to avoid large incisions. Also, we use an arthroscopic sliding knot for knot tying in our technique, which slides the knot near the capsule and secures a tight fixation.

Table 3. Pearls and Pitfalls of This Technique

Pearls	Pitfalls
1. Epidural needle with gentle curvature at the tip is used. This helps in manipulation of the tear and obtaining the perfect bite on the torn meniscus.	1. Multiple needle perforations of meniscus may lead to meniscal tissue injury.
2. Only a stab incision is required at the site of needle entry.	2. Superficial knot tying just underneath skin may lead to tenderness over the knot site, so blunt dissection with mosquito forceps must reach deep into the capsule.
3. Start from posterior aspect of tear and progress anteriorly.	3. Overtightening of the knot may lead to cut through of the meniscal tissue by the suture.
4. Use probe to reduce the torn inner edge of the meniscus. This makes needle passage easier.	4. Cartilage injury may be caused by the epidural needle inside the joint.
5. Do not make multiple punctures into the meniscal substance.	5. A larger knot passing through the meniscus substance may cause tear of meniscus itself.
6. While pulling the sliding knot, probe should be kept in the loop formed by repair suture inside the joint. This prevents cut through from meniscal substance.	6. Two shuttles of sutures are required to apply one stitch in the meniscus.

Table 4. Advantages and Disadvantages of Our Modified Outside-in Meniscus Repair Technique

Advantages	Disadvantages
1 It is a low-cost procedure that can be done with locally available materials in every operation theater. 2 Both vertical and horizontal mattress sutures can be applied. 3 Technique is reproducible. 4 Can be used to repair the longitudinal tear of any part of the medial meniscus.	1. Pie-crusting of superficial MCL is almost always required. 2. Orientation of sutures may not be vertical in posterior horn repair. 3. Relatively larger knot passed through the meniscus may cause injury to meniscus itself.

MCL, medial collateral ligament.

Table 5. Possible Risks Associated With This Technique and Tips to Avoid Them

Risks	Tips to Avoid
Cartilage injury	Multiple needle passages should be avoided and the needle tip must be seen while entering into the joint and through the meniscus.
Meniscus cut-through	Meniscus cut-through can happen in various steps of surgery, such as needle insertion, shuttling and pulling the suture, and knot tying. The tip of the probe can be used to hold the suture loop during the suture movements through the meniscus. Also, caution should be exercised while pulling the knot.
Saphenous nerve injury	If incision falls along the course of the nerve, a superficial skin incision is given (instead of a stab incision) and a soft-tissue tunnel is created using mosquito forceps.
Capsular tear	The capsule can be torn either during making of the soft-tissue tunnel or while applying the sliding knot. The soft-tissue tunnel has to be created carefully and gradually deepened to reach the capsule without violating its integrity. A soft-tissue bridge of capsule has to be maintained between the 2 shuttled-out sutures.
Knot prominence below the skin	A SMC (Samsung Medical center) knot is preferable to avoid knot prominence, as it is less bulky.

Technical pearls and pitfalls along with advantages and disadvantages of our technique are given in Tables 3 and 4. There are various possible risks of this surgical technique. These risks and tips to avoid them are mentioned in Table 5.

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