

“Zip” Lesion of the Lateral Meniscus Repair Technique Using All-Inside Meniscus Repair Device



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Abstract: Ramp lesion of the medial meniscus is an established clinical entity and is one of the causes of the positive pivot-shift test with anterior cruciate ligament (ACL) injury. A similar lesion in the region of the posterior horn of the lateral meniscus extending to the posterior meniscocapsular junction posterior to the popliteal hiatus along with ACL injury is called a “zip lesion.” These patients do exhibit a positive pivot shift under anesthesia. We have encountered different injury patterns to the lateral meniscocapsular junction, which can cause altered knee kinematics, and they should be looked for while performing an ACL reconstruction. Failure to identify and repair these lesions will have a deleterious effect on the knee kinematics. If untreated, these lesions may lead to compromised results of the ACL reconstruction. This Technical Note proposes a repair technique for the zip lesion.

Ramp lesion of the medial meniscus is an established clinical entity and one of the causes of the positive pivot-shift test with anterior cruciate ligament (ACL) injury. A similar lesion in the region of the posterior horn of the lateral meniscus extending to the posterior meniscocapsular junction posterior to the popliteal hiatus along with ACL injury is called a “zip lesion.”¹ These patients do exhibit a positive pivot shift under anesthesia. We have encountered different injury patterns to the lateral meniscocapsular junction, which can cause altered knee kinematics, and they should be looked for while performing an ACL reconstruction. Failure to identify and repair these lesions will have a deleterious effect on the knee kinematics. If untreated, these lesions may lead to compromised results of the ACL reconstruction. This Technical Note proposes a repair technique for the zip lesion.

The consequences of lateral root avulsions and lateral meniscocapsular injuries are less evaluated.

Bao et al.² stated that isolated lateral meniscus posterior root injuries do not functionally behave as a total meniscectomy if the posterior meniscofemoral ligament is intact. Lateral root tears with posterior meniscofemoral ligament disruption have been shown to increase mean contact pressures by 49%, decrease the contact area by 33%, and behave as a complete meniscectomy.³

The pivot-shift phenomenon is multifactorial. With growing evidence that meniscal, meniscocapsular, and anterolateral complex injury may play a role in rotatory knee instability, it is important for the clinician to be aware of concomitant soft tissue injuries with planned ACL reconstruction procedures.

These injuries can be successfully treated with all-inside devices to achieve a stable repair with additional advantages such as using only anterior portals and reducing duration of surgery (Table 1).

Surgical Technique

Patient Positioning and Portals

The patient, under spinal anesthesia, is placed supine on the operation table. A tourniquet is applied over the proximal thigh and inflated (Video 1). Standard arthroscopic portals are used. The anterolateral (AL) portal is made first in a higher position. An anteromedial portal is made under arthroscopic visualization with a 30° arthroscope.

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Table 1. Advantages and Disadvantages of the Procedure

Advantages	Disadvantages
The classification system is simple to understand and document. Repair method does not need additional portals. It is time saving and reproducible. Achieves stable meniscus repair. No need for special instrumentation.	The cost of the all-inside device may be prohibitive.

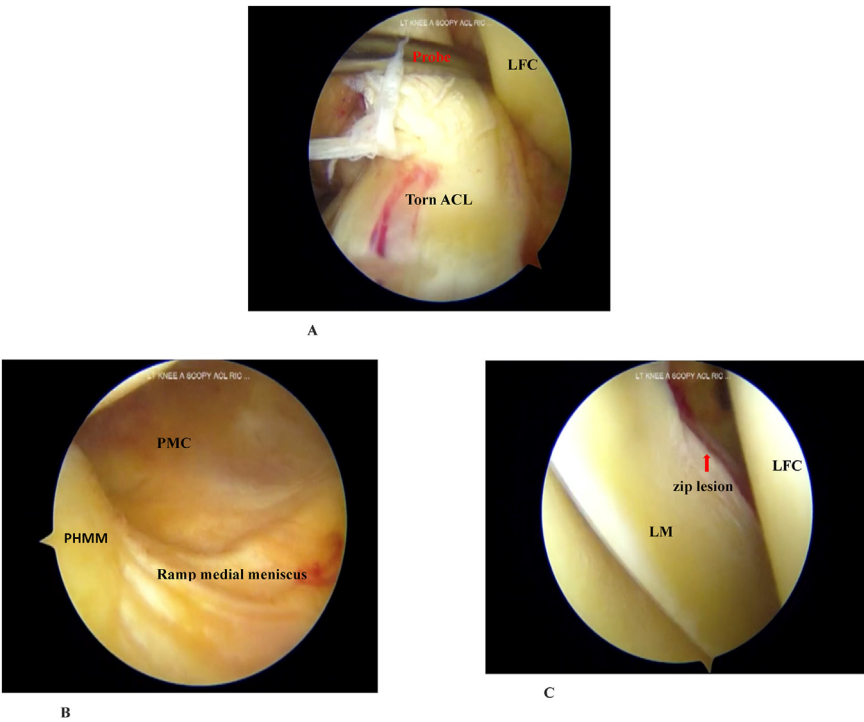


Fig 1. (A) Left knee at 90° of knee flexion from the anterolateral (AL) port showing a full-thickness ACL tear and empty wall of the lateral femoral condyle with probe. (B) Left knee at 90° of knee flexion from the AL port showing the posteromedial compartment with an intact ramp. (C) Left knee in figure-of-4 position from the AL port showing the zip lesion of the lateral meniscocapsular junction. (ACL, anterior cruciate ligament; LFC, lateral femoral condyle; LM, lateral meniscus; PHHM, posterior horn of medial meniscus; PMC, posteromedial capsule.)

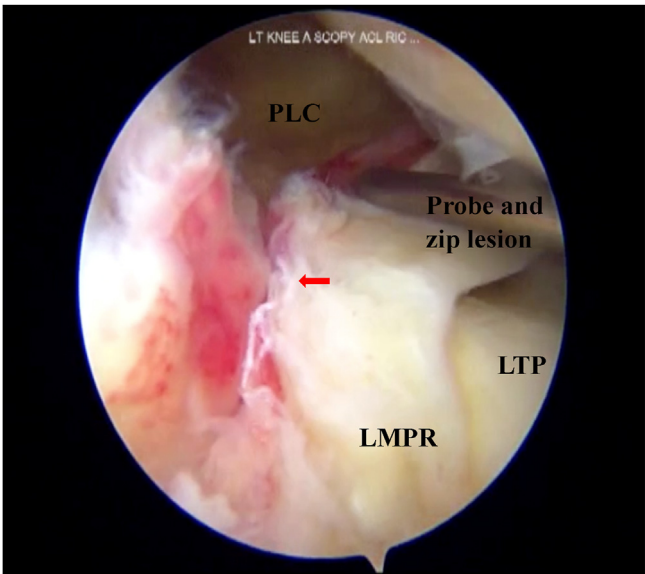


Fig 2. Left knee in figure-of-4 position viewing from the anteromedial port showing the probe palpating the zip lesion from anterolateral port. Red arrow indicates extension of the tear in the posterior root of the lateral meniscus. (LMPR, lateral meniscus posterior root; LTP, lateral tibial plateau; PLC, posterolateral capsule.)



Fig 3. Left knee in figure-of-4 position from the anteromedial port showing probing of the inferior surface tear of the lateral meniscus.

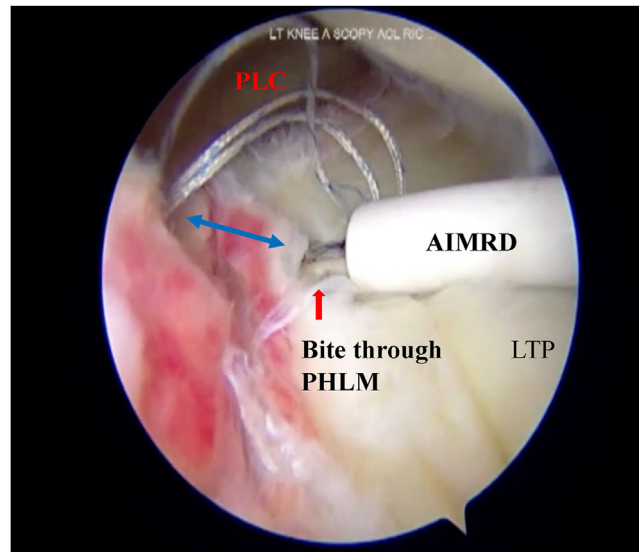
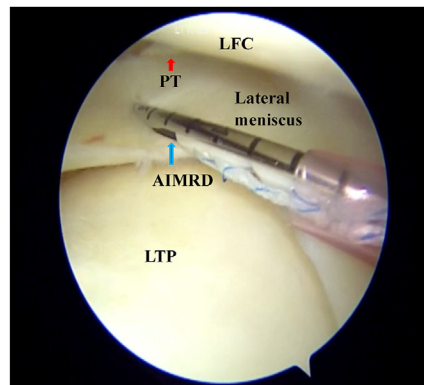
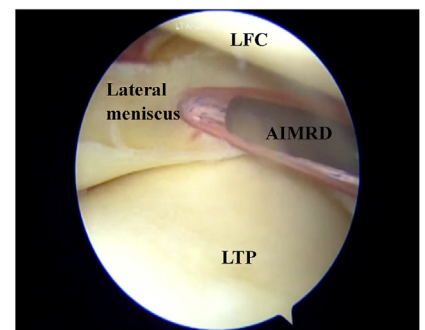


Fig 4. Left knee in figure-of-4 position from the anteromedial port showing first stitch in the vertical configuration. (AIMRD, all-inside meniscus repair device; LTP, lateral tibial plateau; PHLM, posterior horn of lateral meniscus; PLC, posterolateral capsule.)

Fig 5. (A) Left knee in figure-of-4 position the anteromedial (AM) port showing the second stitch in a horizontal configuration on the superior meniscal surface posterior to the popliteal hiatus. (B) Left knee in figure-of-4 position from the AM port showing complete deployment of the second stitch. (AIMRD, all-inside meniscus repair device; LFC, lateral femoral condyle; LTP, lateral tibial plateau; PT, popliteal tendon.)



A



B

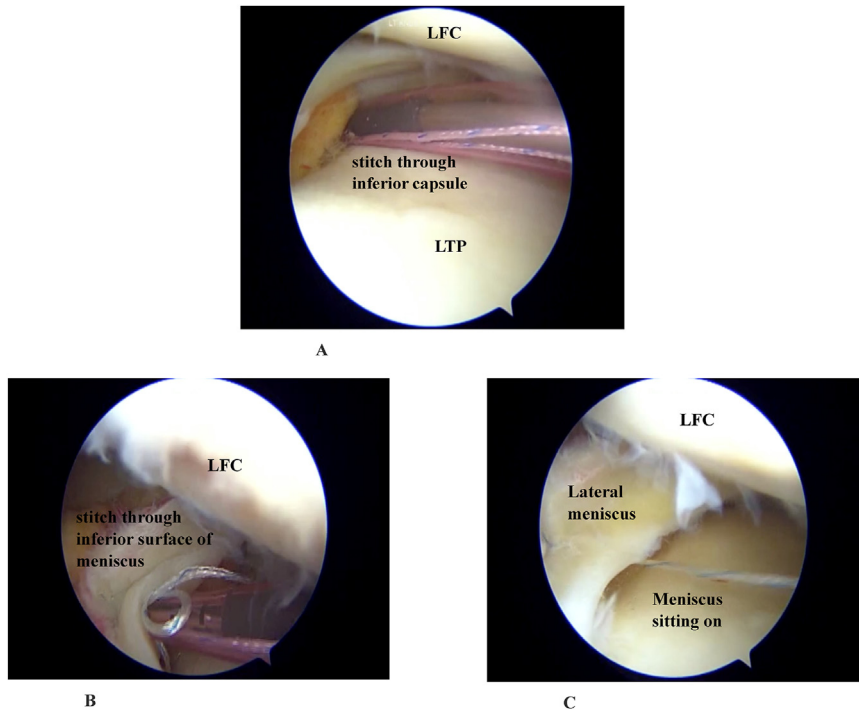


Fig 6. (A) Left knee in figure-of-4 position from the anteromedial (AM) port showing stitch through the inferior capsule (third stitch). (B) Left knee in figure-of-4 position from the AM port showing the second pass of the third stitch through the inferior surface of the meniscus. (C) Left knee in figure-of-4 position from the AM port showing the completed stitch with meniscus stable on the tibial surface. (LFC, lateral femoral condyle; LTP, lateral tibial plateau.)

Diagnostic Round

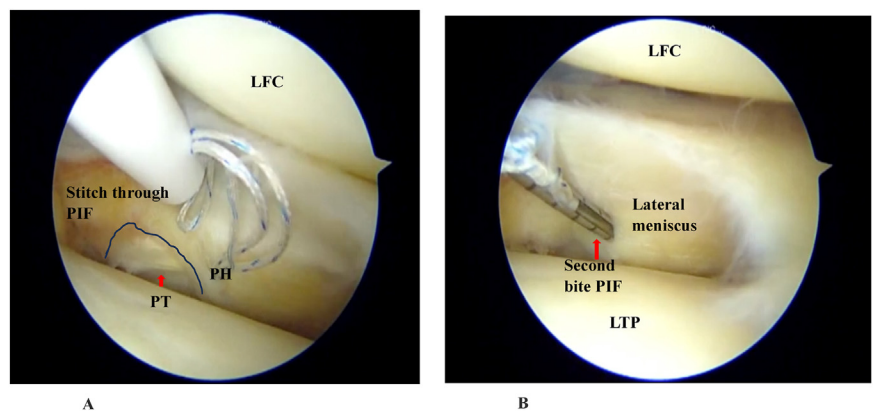
The presence of an ACL tear is confirmed (Fig 1A), and the scope is passed into the posteromedial compartment to find a concomitant “ramp” lesion (Fig 1B). The knee is then taken into figure-of-4 position to discover the injury to the posterolateral capsule (zip lesion). Once the zip lesion is identified (Fig 1C), the scope is switched to the anteromedial port and a probe is passed from the AL port to identify the type and the extent of the zip lesion. The lesion is seen extending in the posterior root of the lateral meniscus with avulsion of the posterolateral capsular complex (Fig 2).

Preparation and Repair

A meniscal rasp is passed from the AL port with the knee in figure-of-4 position to rasp the tear for improved healing. The inferior surface of the meniscus is probed to discover the inferior extension of the tear (Fig 3). These tears can be repaired by an all-inside meniscus repair device (Fast Fix 360 reverse curved; Smith & Nephew) by taking the first stitch toward the root of the lateral meniscus. The stitch is taken in the vertical configuration, fixing the most medial part of the tear (Fig 4).

Because of the thin nature of the posterolateral capsule, the stitch should preferably include the

Fig 7. (A) Left knee in figure-of-4 position from the anterolateral (AL) port showing first pass of the stitch through the posteroinferior fascicle as the fourth stitch. (B) Left knee in figure-of-4 position from the AL port showing second pass of the fourth stitch through the posteroinferior fascicle. Red arrow indicates PIF. (LFC, lateral femoral condyle; LTP, lateral tibial plateau; PH, posterior horn; PIF, posteroinferior fascicle; PT, popliteal tendon.)



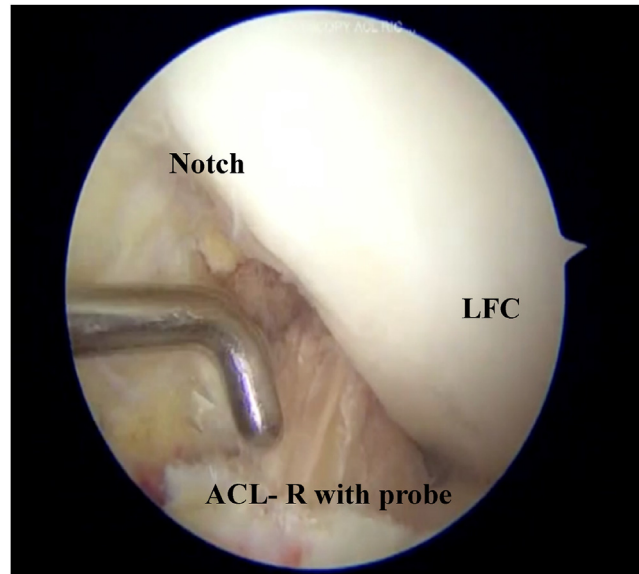


Fig 8. Left knee in 90° of flexion through the anterolateral port showing completed ACL reconstruction after the zip lesion repair. (ACL-R, anterior cruciate ligament reconstruction; LFC, lateral femoral condyle.)

meniscal tissue; hence, a horizontal suture configuration has a better hold and chance of deployment. This also covers a larger area of repair. A second stitch is taken just posterior to the popliteus hiatus using a flexible all-inside device (Fast Fix 360 flexi; Smith & Nephew). The flexible device allows bending of the needle as well as the shaft of the device to a desired angle, thus adding to the ease of gaining proper trajectory for deployment (Fig 5).

The third stitch is taken in the similar fashion on the inferior surface through the posteroinferior capsule and the inferior surface of the meniscus, thus making the

meniscus stable on the tibial plateau (Fig 6). The scope is now switched to the AL port, and an inferior surface stitch is taken through to stabilize the meniscus near the popliteal hiatus through the posteroinferior meniscal fascicle (Fig 7). A suction test is performed to check the repair stability, and ACL reconstruction is completed to conclude the procedure (Fig 8).

Discussion

The posterior horn of the lateral meniscus has an attachment to the tibia by the posterolateral meniscotibial ligament (PLMTL). The average length of this is

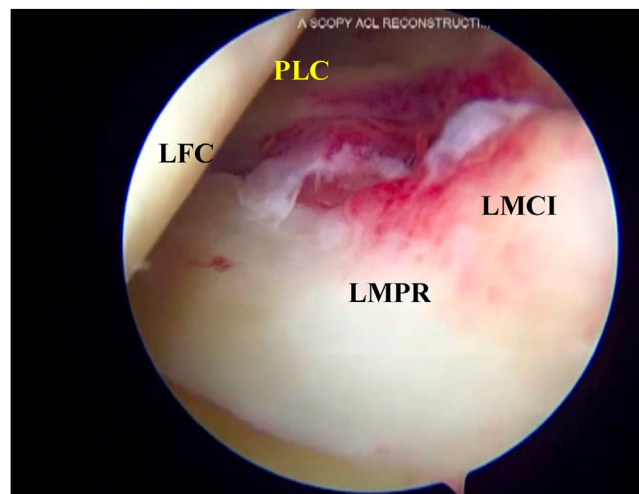


Fig 9. Right knee in figure-of-4 position through the anteromedial port showing meniscocapsular disruption of the posterolateral capsule. (LFC, lateral femoral condyle; LMCI, lateral meniscocapsular injury; LMPR, lateral meniscus posterior root; PLC, posterolateral capsule.)

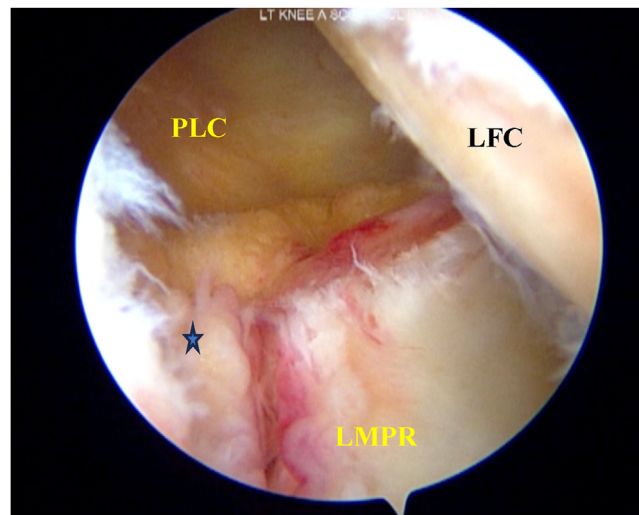


Fig 10. Left knee in figure-of-4 position through the anteromedial port showing a posterolateral meniscocapsular injury extending into the posterior root of the lateral meniscus. Blue star indicates posterolateral capsular complex. (LFC, lateral femoral condyle; LMPR, lateral meniscus posterior root; PLC, posterolateral capsule.)

12.8 mm. Its most medial attachment lies 6 mm from the centre of the posterior root of the lateral meniscus (PRLM). The area from the most lateral aspect of PLMTL to the most anterior aspect of the popliteal hiatus is restrained only by the posterolateral capsule and the inferior popliteo-meniscal fascicle. This is the most mobile portion of the lateral meniscus.⁴ Therefore, although there is a lack of evidence, it can be said that PLMTL attributes to the stability of the PHLM.⁵ Hence, a biomechanical injury to the posterolateral capsule will behave as a lateral meniscal posterior root tear (LMPRT), causing a high-grade pivot shift. The posterior meniscomfemoral ligament (pMFL) is also attached to the meniscus in the same anatomical region, which was injured during this meniscomfemoral separation, rendering the meniscus non-functional. As zip lesions

can lead to a positive pivot-shift phenomenon and influence outcomes of ACL surgery, the pathomechanics of the injury need evaluation. These lesions are found in conjunction with “ramp” lesions, indicating a greater translational force at the time of injury. It would be worthwhile to observe the prevalence of zip lesions with ramp lesions as both are capsular avulsions of the posterior capsule of the knee. The common tear patterns encountered are shown in [Figures 9–11](#).

Disclosures

All authors (M.V.P., H.G.P) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

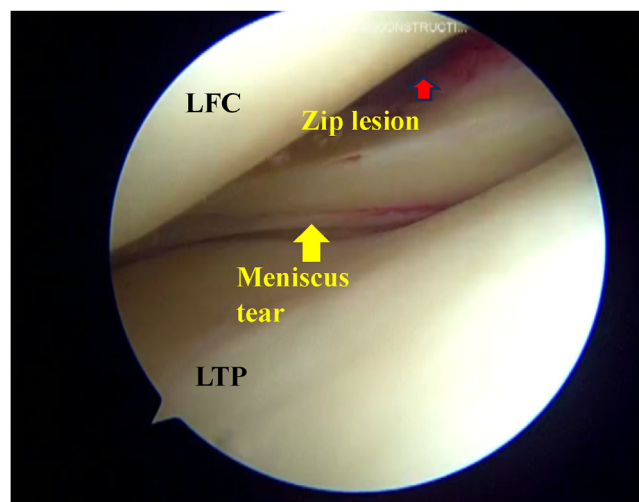


Fig 11. Left knee in figure-of-4 position through the anterolateral port showing meniscocapsular injury (zip lesion) and inferior surface meniscus tear. (LFC, lateral femoral condyle; LTP, lateral tibial plateau.)

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