All-Inside Lateral Meniscal Repair via Anterolateral Portal Increases Risk of Vascular Injury: A Cadaveric Study

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Purpose: To compare the distance from the device tip to the neurovascular structures during an all-inside medial and lateral meniscal repair using anteromedial and anterolateral portals in a fresh-frozen cadaveric study. **Methods:** Ten fresh-frozen cadaveric knees were studied. The popliteal artery, popliteal vein, and tibial nerve were identified after dissection via a posterior approach. An all-inside meniscal repair device was set to a 20-mm depth limit and inserted into a fixed point in the posterior horn at the meniscocapsular junction. This was performed for medial and lateral menisci via anteromedial and anterolateral arthroscopic portals. The distances between the device tip and the neurovascular structures were measured. We performed *t* tests to determine statistical significance. **Results:** The distance between the device and popliteal artery was significantly closer when aimed at the posterior horn of the lateral meniscus via the anterolateral portal (4.7 $\pm$ 2.3 mm) versus the anteromedial portal (13.0 $\pm$ 8.0 mm, $P = .010$). The distance to the popliteal vein was closer via the anterolateral portal (6.7 $\pm$ 2.9 mm) versus the anteromedial portal (13.9 $\pm$ 5.8 mm, $P = .004$). For medial meniscal repair, the distance to the popliteal artery was significantly closer via the anteromedial portal (12.8 $\pm$ 11.3 mm) versus the anterolateral portal (23.8 $\pm$ 7.7 mm, $P = .022$). The distance to the popliteal vein was closer via the anteromedial portal (16.5 $\pm$ 11.3 mm) versus the anterolateral portal (28.3 $\pm$ 8.2 mm, $P = .017$). No significant difference was found in the distance to the tibial nerve when aimed at either meniscus via either portal. **Conclusion:** For all-inside meniscal repair, the popliteal vein is at risk and the popliteal artery is at high risk of injury when the posterior horn of the lateral meniscus is repaired via an anterolateral working portal. **Clinical Relevance:** The popliteal artery and vein are at risk of injury when the posterior horn of the lateral meniscus undergoes all-inside repair via the anterolateral portal. Surgeons need to be aware of the risks when performing this repair.

There is a higher risk of complications in arthroscopic knee surgery with more complex procedures such as meniscal repair, synovectomy, and anterior and posterior cruciate ligament reconstruction.[1] For arthroscopic meniscal surgery, the incidence of nerve injury is reported to be up to 0.6% and that of arterial injury, up to 0.03%.[2-5] Popliteal artery injury and sequelae such as pseudoaneurysms and arteriovenous fistulas from arthroscopic meniscal repair are rare, with few reports published in the literature.[6,7] Severe neurovascular complications can occur, including irreversible ischemia, compartment syndrome, permanent neurologic deficit, limb loss, and even death.[8]

The popliteal artery is in close proximity to the lateral meniscus in the posterior knee. In a magnetic resonance imaging study, de Araujo Goes et al.[9] reported that the mean distance from the popliteal artery to the tibial plateau was 9.54 mm. Keser et al.[10] found the popliteal artery to lay lateral to the midline in 94% of cases.

There are limited studies on the effect of the choice of working portal for meniscal repair on the risk of neurovascular injury. This is important as the use of all-inside devices becomes more common. As surgeons introduce these devices from either the anteromedial or anterolateral portal, they must be aware of any increased risks when doing so.

The purpose of this study was to compare the distance from the device tip to the neurovascular structures

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during an all-inside medial and lateral meniscal repair using anteromedial and anterolateral portals in a fresh-frozen cadaveric study. We hypothesized that these structures would be at greatest risk with lateral meniscal repair via the anterolateral portal.

Methods

Ten fresh-frozen, cadaveric, full–knee joint specimens that included the proximal tibia and fibula to the distal half of the femur with surrounding soft tissues were obtained from a commercial source (Medcure, Portland, OR). All specimens were accredited by the American Association of Tissue Banks regarding their standards. Both the first author (D.W.M.) and senior author (D.L.Y.H.) inspected each specimen externally for anatomic abnormalities prior to dissection. On dissection, the specimens were also inspected to ensure consistency. The study was performed at our institution's surgical skills laboratory.

Preparation and Dissection

There were 6 male and 4 female specimens with a mean age of 69 years (range, 61-88 years). The 10 knee specimens were dissected via a single midline posterior approach by the primary author (D.W.M.) and an assistant (S.T.) (Fig 1). The soft tissues (skin, muscle, and fat) were held in place with stay sutures to improve visualization. The popliteal artery, popliteal vein, and tibial nerve were carefully identified and preserved. Care was taken to ensure that the location of these structures in relation to the knee capsule was preserved. Each cadaveric knee with the posterior neurovascular structures dissected was then placed on a leg holder for arthroscopy.

Setup for Arthroscopy

The femoral shaft of the cadaveric knee was clamped to the leg holder that enabled knee flexion, with the distal end of the tibia and fibula left free. The knee specimens, mounted on the leg holder, were placed on the dissection table for arthroscopy, with the knee in 90° of flexion. A gravity irrigation pump system was used to simulate arthroscopic conditions. This setup allowed for cadaveric knee arthroscopy and meniscal repair by the senior surgeon, with the primary author and the assistant positioned at the back of the knee to perform the measurements.

Arthroscopy

The knee arthroscopy was performed by the senior surgeon with a 30° arthroscope. The standard anterolateral portal is usually placed in a palpable soft spot 1 cm above the joint line just next to the patellar tendon, and the anteromedial portal is usually 1 cm medial to the patellar tendon.[6] However, we wanted our portals to be as close to the patellar tendon as possible to allow us to reach the midline regions of the posterior horns of the medial and lateral menisci with the best trajectory. To do this in a consistent manner, we placed our portals 5 mm medial and lateral to the patellar tendon. A shaver was used to clear any soft tissue to improve visibility.

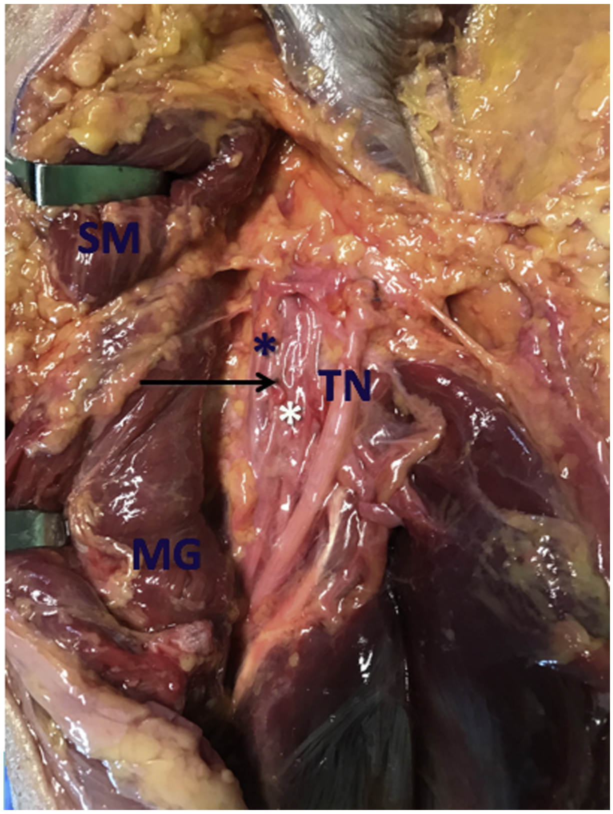

Fig 1. Posterior approach used for measurements in a right knee. The following anatomic structures can be seen: popliteal artery (blue asterisk), popliteal vein (white asterisk), tibial nerve (TN), medial gastrocnemius (MG), and semimembranosus (SM). The tip of the meniscal repair device (arrow) is very close to the popliteal artery and vein.

The all-inside repair device used for this study was the FasT-Fix 360 curved needle (Smith & Nephew, London, England). For each specimen, the device was first introduced into the knee joint by the senior author in the anteromedial working portal with a anterolateral viewing or scope portal, as seen in Figure 2. This was subsequently switched around, with the all-inside device introduced from the anterolateral working portal with an anteromedial viewing or scope portal for the camera.

Simulated Meniscal Repair

The posterior horns of the medial and lateral menisci in each knee were visualized. The penetration-depth limiter on the all-inside repair device was set to 20 mm. For each case, this was inserted into a point in the posterior horn at the meniscocapsular junction

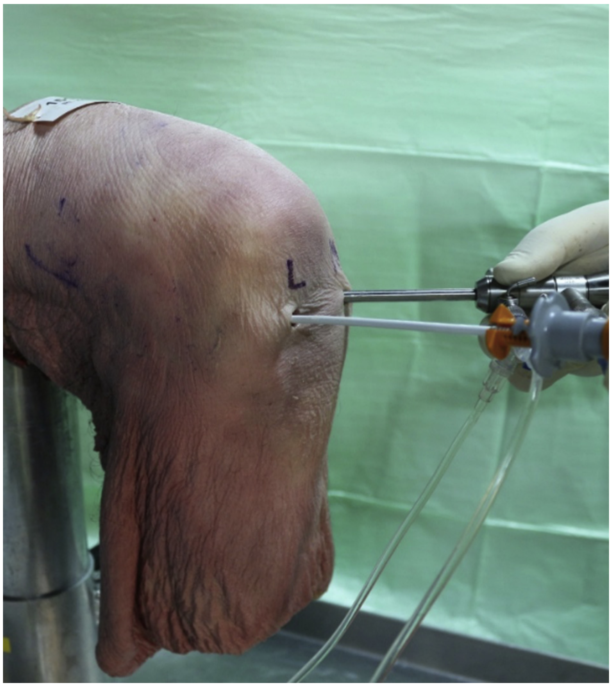

Fig 2. Lateral view of a cadaveric right knee with the combination of a medial viewing portal for the camera and an anterolateral working portal (L) for the all-inside meniscal repair device.

(Fig 3). This point was made 5 mm medial to the medial meniscal root insertion and 5 mm lateral to the lateral meniscal root insertion. The distance from the meniscal root was measured arthroscopically using a 3—mm—tip width arthroscopic probe. A 5-mm marking was made on the long arm of the probe with a permanent marker and was used to measure the 5-mm distance in all specimens.

This point was chosen because it simulated the worst-case scenario (in which the penetration is closest to the popliteal neurovascular bundle) in a meniscal repair for the surgeon, having to place a stitch at the meniscocapsular junction and close to the meniscal posterior root. We used a percutaneous medial collateral ligament release to aid access to the posterior horn of the medial meniscus. The use of this technique was described by Todor et al.[11] when encountering this difficulty.

Measurements

For each penetration, the tip of the device was visualized by the primary author and assistant. The closest distances between the device tip and the popliteal artery, popliteal vein, and tibial nerve were measured by direct visualization with an electronic caliper by the primary author (Fig 4).

The distances from the meniscal repair device tip to the popliteal artery, popliteal vein, and tibial nerve were measured initially for the anteromedial portal—medial meniscus combination. This was then repeated for the anterolateral portal—medial meniscus, anteromedial portal—lateral meniscus, and anterolateral portal—lateral meniscus combinations, giving a total of 12 measurements per cadaveric knee, for a total of 120 measurements. The results were then recorded and collated (Table 1).

Statistics

The Shapiro-Wilk test, performed using IBM SPSS Statistics (version 23; IBM, Armonk, NY), found our data were normally distributed. By use of our data for the popliteal artery distance in lateral meniscal repair, the Cohen *d* effect size was calculated to be 1.4. Power analysis using G*Power software (version 3.1.9.3; Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany) with an α of .05, power of 0.8, and effect size of 1.4 found that a minimum sample size of 10 was required to detect statistical significance.

Two-sample *t* tests assuming unequal variance were used to evaluate the difference in the distances between the repair device tip and the neurovascular structures. $P = .05$ was used to indicate statistically significant distances. Two-tailed *P* values were reported. Statistical analysis was performed with Microsoft Excel Data Analysis ToolPak software (version 16.17; Microsoft, Redmond, WA).

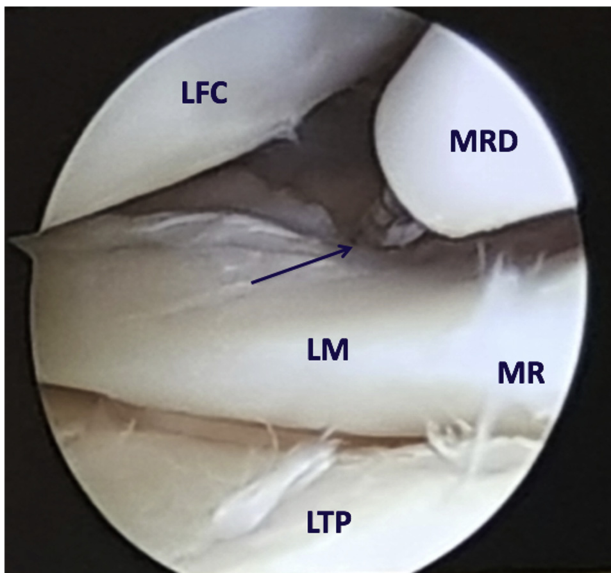

Fig 3. Arthroscopic image in a right knee from the anterolateral viewing portal showing the meniscal repair device (MRD) inserted into the lateral meniscocapsular junction from the anteromedial working portal with the penetration limiter set to 20 mm. The structures seen are the lateral meniscus (LM), meniscal root (MR), lateral femoral condyle (LFC), and lateral tibial plateau (LTP). The device was inserted at the junction between the posterior horn of the lateral meniscus and the capsule (arrow).

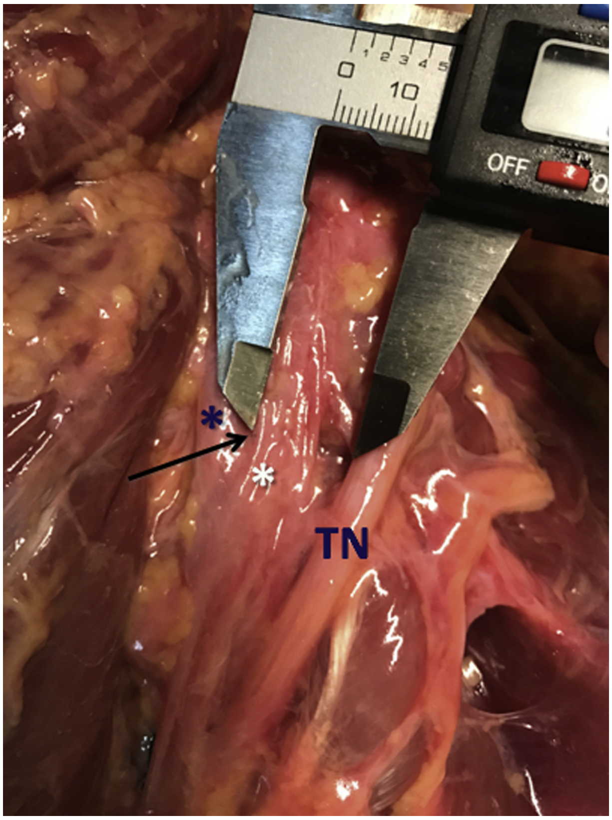

Fig 4. Caliper used for measurements through a posterior approach to the right knee. The following anatomic structures can be seen: popliteal artery (blue asterisk), popliteal vein (white asterisk), and tibial nerve (TN). The tip of the meniscal repair device (arrow) is very close to the popliteal artery and vein.

Results

In the study by Cuéllar et al.,[12] a reported distance of less than 10 mm was considered at risk of injury and less than 5 mm was considered at high risk. We considered distances of 10 mm or greater to be at lower risk. We similarly reported distances and risk levels in our results (Table 1).

Distance From Popliteal Artery in Medial Meniscal Repair

For medial meniscal repair, the distance from the device tip to the popliteal artery was closer via the anteromedial portal (mean, 12.8 ± 11.3 mm; range, 1-37 mm) versus the anterolateral portal (mean, 23.8 ± 7.7 mm; range, 15-36 mm). This was statistically significant ($P = .022$; effect size, 1.51). The mean distance to the popliteal artery was at lower risk (≥10 mm) when the medial meniscus was repaired via either portal. For repair via the anterolateral portal, all trials were at lower risk (≥10 mm). However, via the anteromedial portal, 5 repairs with the popliteal artery were at risk (<10 mm), of which 3 repairs were at high risk (<5 mm).

Distance From Popliteal Artery in Lateral Meniscal Repair

The distance between the repair device and the popliteal artery was closer when aimed at the posterior horn of the lateral meniscus via the anterolateral portal (mean, 4.7 ± 2.3 mm; range, 2-9 mm) versus the anteromedial portal (mean, 13.0 ± 8.0 mm; range, 3-24 mm). This affirmed our hypothesis that inserting the device via the anterolateral portal through the lateral meniscus would bring the device significantly closer to the popliteal artery ($P = .010$; effect size, 1.69), placing it at high risk (distance < 5 mm) of injury. Notably, all 10 trials using the anterolateral portal placed the popliteal artery at risk (<10 mm), of which 5 were at high risk (<5 mm). Although the mean distance using the anteromedial portal was at lower risk (≥10 mm), there were still 4 trials that placed the popliteal artery at risk (<10 mm), of which 2 were at high risk (<5 mm).

Distance From Popliteal Vein in Medial Meniscal Repair

The distance from the device tip to the popliteal vein was closer via the anteromedial portal (mean, 16.5 ± 11.3 mm; range, 2-39 mm) versus the anterolateral portal (mean, 28.3 ± 8.2 mm; range, 18-42 mm), which was statistically significant ($P = .017$; effect size, 1.57). The mean popliteal vein distance from either portal was at lower risk (≥10 mm). Although all 10 trials from the anterolateral portal were at lower risk (≥10 mm), 3 trials from the anteromedial portal still placed the popliteal vein at risk (<10 mm), of which 1 was at high risk (<5 mm).

Distance From Popliteal Vein in Lateral Meniscal Repair

The distance from the device tip to the popliteal vein was closer via the anterolateral portal (mean, 6.7 ± 2.9 mm; range, 2-11 mm) versus the anteromedial portal (mean, 13.9 ± 5.8 mm; range, 6-25 mm), which was statistically significant ($P = .004$; effect size, 1.88). The mean popliteal vein distance was at risk (<10 mm) when the lateral meniscal repair was performed via the anterolateral portal. Nine trials placed the popliteal vein at risk (<10 mm), of which 2 were at high risk (<5 mm). For repair via the anteromedial portal, 2 trials placed the popliteal vein at risk (<10 mm), none of which were at high risk (<5 mm).

Distance From Tibial Nerve in Medial and Lateral Meniscal Repair

For the medial meniscus, there was no significant difference in the distance from the device tip to the tibial nerve via the anteromedial portal (mean, 28.6 ± 10.3 mm; range, 12-45 mm) versus the anterolateral portal (mean, 37.2 ± 9.9 mm; range, 24-52 mm; $P = .072$; effect size, 1.24). For the lateral meniscus,

Table 1. Distances From Repair Device Tip to Neurovascular Structures

	Distance to Popliteal Artery				Distance to Popliteal Vein				Distance to Tibial Nerve			
	Medial Meniscus		Lateral Meniscus		Medial Meniscus		Lateral Meniscus		Medial Meniscus		Lateral Meniscus	
	AMP	ALP	AMP	ALP	AMP	ALP	AMP	ALP	AMP	ALP	AMP	ALP
Cadaver 1, mm	5	16	3	2	11	20	10	5	35	37	29	15
Cadaver 2, mm	21	27	22	6	27	34	16	2	31	37	7	7
Cadaver 3, mm	3	26	21	2	2	33	17	3	12	34	12	11
Cadaver 4, mm	37	23	12	3	39	26	15	5	45	33	20	11
Cadaver 5, mm	1	15	20	3	8	20	25	8	33	25	30	30
Cadaver 6, mm	4	16	24	9	6	18	20	11	16	24	12	18
Cadaver 7, mm	16	18	10	7	18	24	12	9	36	32	18	22
Cadaver 8, mm	7	35	8	5	12	42	10	9	20	50	18	24
Cadaver 9, mm	12	36	6	6	16	38	8	9	24	52	18	14
Cadaver 10, mm	22	26	4	4	26	28	6	6	34	48	14	18
Distance < 5 mm (at high risk), n	3	0	2	5	1	0	0	2	0	0	0	0
Distance < 10 mm (at risk), n	5	0	4	10	3	0	2	9	0	0	1	1
Distance ≥ 10 mm (at lower risk), n	5	10	6	0	7	10	8	1	10	10	9	9
Mean, mm	12.8	23.8	13.0	4.7	16.5	28.3	13.9	6.7	28.6	37.2	17.8	17.0
SD, mm	11.3	7.7	5.8	2.3	11.3	8.2	5.8	2.9	10.3	9.9	7.3	6.9
Range, mm	1-37	15-36	3-24	2-9	2-39	18-42	6-25	2-11	12-45	24-52	7-30	7-30
P value	.022		.010		.017		.004		.072		.80	
Effect size	1.51		1.69		1.57		1.88		1.24		0	

ALP, anterolateral portal; AMP, anteromedial portal; SD, standard deviation.

there was also no significant difference in the distance from the device tip to the tibial nerve via the anteromedial portal (mean, 17.8 ± 7.3 mm; range, 7-30 mm) versus the anterolateral portal (mean, 17.0 ± 6.9 mm; range, 7-30 mm; $P = .80$; effect size, 0).

The tibial nerve mean distance from the device tip was at lower risk (≥10 mm) for all of the meniscus-portal combinations. In only 2 trials was the tibial nerve at risk (<10 mm), once with lateral meniscal repair via the anteromedial portal and once with lateral meniscal repair via the anterolateral portal. No trials placed the tibial nerve at high risk (<5 mm).

Discussion

Our study showed that when the posterior horn of the lateral meniscus was repaired via the anterolateral portal, the mean popliteal artery distance was at high risk (<5 mm) and the mean popliteal vein distance was at risk (<10 mm) from the repair needle. Notably, all 10 trials from the anterolateral portal placed the popliteal artery at risk (<10 mm), of which 5 were at high risk (<5 mm). There was a lower risk with lateral meniscal repair via the anteromedial portal (mean distance ≥ 10 mm); however, it was not a risk-free repair. Four trials placed the popliteal artery at risk (<10 mm), of which 2 were at high risk (<5 mm). The popliteal vein was also at risk (<10 mm) in 9 trials from the anterolateral portal, of which 2 were at high risk (<5 mm). Two trials from the anteromedial portal placed the popliteal vein at risk (<10 mm).

In medial meniscal repair via either portal, the mean distances from the popliteal vessels to the repair needle were all at lower risk (≥10 mm). For repair via the anterolateral portal, there were no instances in which the popliteal artery or vein was at risk (<10 mm). For repair of the medial meniscus via the anteromedial portal, although the mean distance to the neurovascular structures was greater than 10 mm, it could not be considered a risk-free repair. There were still 5 trials that placed the popliteal artery at risk (<10 mm), of which 3 were at high risk (<5 mm), and 3 trials that placed the popliteal vein at risk (<10 mm), of which 1 was at high risk (<5 mm).

Baena et al.[13] reported that for inside-out medial meniscal repair, the mean distances from the repair device needle to the popliteal neurovascular bundle were 33 mm from the anterolateral portal, 27.6 mm from the central portal, and 22.6 mm from the anteromedial portal. We similarly showed that for medial meniscal repair, the distance was closer when working from the anteromedial portal for all-inside medial meniscal repair. The distance to the popliteal artery was 23.8 mm from the anterolateral portal and 12.8 mm from the medial portal. Baena et al. limited their study's focus to only medial meniscal repair, in which the distances did not place the popliteal artery at as much risk as lateral meniscal repair. Similarly to our study, they used fresh-frozen cadaveric knee specimens; however, in contrast to our posterior approach, they performed a sizeable transverse dissection at the level of the joint line for visualization, which may affect the position of the neurovascular structures and the accuracy of their measured distances.

Cohen et al.[14] performed a cadaveric radiographic study looking at the distances between FasT-Fix versus RapidLoc (DePuy Mitek, Raynham, MA) repair devices and barium-filled popliteal arteries on radiographs after lateral meniscal repair. The average distances on radiographs were 0.5 ± 0.8 mm on the lateral view and 6.0 ± 6.2 mm on the anteroposterior (AP) view. Of 7 knees, 3 came within 3 mm on both AP and lateral views. Our study found that the distance from the repair device tip to the popliteal artery with lateral meniscal repair via the anterolateral portal was 4.7 ± 2.3 mm. Cohen et al. also used fresh-frozen cadavers; however, a limitation of their study was that the distances were only measured in 2 radiographic planes: AP and lateral. Our study performed cadaveric dissections and measured the shortest distances, not limited to only 2 planes. The standard depth limiter for meniscal penetration was also not used by Cohen et al. The 25-mm insertional depth for the FasT-Fix repair device used for their study potentially shortened the distances to the neurovascular structures. It is difficult to draw relevance to a clinical scenario in which depth limiters are usually used to protect against neurovascular injuries.

Cuéllar et al.[12] found that the median distance between the popliteal artery and a FasT-Fix meniscal repair device inserted into the posterior horn of the lateral meniscus via the anterolateral portal was 13.0 mm in 90° of knee flexion, decreasing to 10.5 mm in 45° of flexion and 5.5 mm in full extension, suggesting that the popliteal artery was only at risk when the knee was in full extension. In comparison, our study found that the popliteal artery was at high risk of injury (distance $<$ 5 mm) even in 90° of knee flexion when the lateral meniscus was repaired via the anterolateral portal. Similarly to our study, Cuéllar et al. used fresh-frozen cadaveric knee specimens, as well as a depth limiter set at 20 mm for device insertion. In contrast to our posterior approach to the knee, their study used a Henderson posterolateral approach, which could have potentially increased the distances from the neurovascular structures to the knee capsule, especially during retraction and exposure for distance measurements.

Massey et al.[15] found in a fresh-frozen cadaveric study that the mean distances from the repair device tip to the popliteal neurovascular bundle in a lateral meniscal repair from anteromedial, transpatellar, and anterolateral approaches were 6.9, 6.5, and 3.1 mm, respectively. These findings were similar to our mean distance of 4.7 mm with repair via the anterolateral portal. However, we found that the distance with repair via the anteromedial portal was further from the popliteal artery, at 13.0 mm. Their study was limited to investigating only lateral meniscal repair without assessing neurovascular injury risk in medial meniscal repair. One key difference in their study was that they measured the distance only to the closest edge of the nearest neurovascular structure rather than a specific artery, vein, or nerve as we have done in our study. There was also capsule underpenetration in several trials reported by Massey et al. as the penetration depths were 10 to 16 mm, which could have affected their data set. The findings of our study are relevant for repair of the posterior horn of the lateral meniscus in which neurovascular structures are at risk of injury when using an anterolateral working portal. More surgeons are attempting lateral meniscal root repairs and lateral meniscal radial root repairs.[16] When placing a suture near the root of the lateral meniscus via an anterolateral working portal, surgeons need to pay extra attention and take care when using this trajectory for repair. We showed that using the anteromedial working portal puts the neurovascular structures at a lower risk of injury. Another factor to consider to lower the neurovascular injury risk would be judicious limitation of penetration depths to 14 to 16 mm, especially when inserting the meniscal repair device in the meniscal periphery in the red-red zone.[15,17,18]

Our study highlights the risk of neurovascular injury with all-inside meniscal repair, especially of the lateral meniscus via the anterolateral portal. The mean distances from the tip of the device to the popliteal artery and vein were 4.7 and 6.7 mm, respectively. In addition, switching the portal will decrease the proximity to the neurovascular bundle, with the result of less risk of injury.

The strengths of our study include the use of fresh-frozen cadavers, which allowed for the preservation of knee joint motion, as well as the integrity of the posterior neurovascular structures, without the need for extensive dissection or soft-tissue releases. A careful dissection of the knee by a posterior approach allowed for clear visualization and ease of distance measurement from the device tip to the posterior neurovascular structures while maintaining their anatomic relation to the joint capsule. The penetration-depth limiter was set at 20 mm, which allowed for a realistic simulation of the worst-case scenario for iatrogenic neurovascular injury when performing posterior horn meniscal repair near the root.

Limitations

Our study is not without limitations. A wide range of measurements were seen for medial meniscal repairs via the anteromedial portal, which can be accounted for by the more difficult access to the posterior horn of the medial meniscus. For the popliteal vein, this may be related to the inherent anatomic variability of the vein, being less fixed in location.[19,20] We noted that the vein was less tethered to soft tissue, which also made it slightly more mobile.

The medial compartment was tighter and harder to access in all specimens compared with the lateral compartment. This made medial meniscal repair more difficult and more variable in each specimen. To be consistent with clinical scenarios, we used a described technique for percutaneous medial collateral ligament release to open the medial compartment to aid access to the posterior horn in all specimens.[11]

Despite careful identification and preservation of the posterior neurovascular structures, there is always the possible effect on the position of the structures during the dissection, which also may in part contribute to some outliers and the wide range in some of the distance measurements. Another factor that may have influenced our distance measurements was our choice of portal positions at 5 mm medial and lateral to the patellar tendon (rather than the standard positioning 1 cm medial and 1 cm lateral to the patellar tendon) to obtain the best trajectory to the posterior horn of each meniscus.

In our study, the menisci were repaired in 90° of knee flexion. This was required by our setup, in which we had to visualize the penetration of the device from the back of the knee. Several studies have previously shown that a flexed position of the knee brings the neurovascular structures further from the tibia and meniscus.[12,21,22] This may not reflect the usual extended knee position for medial meniscal repair, which could affect the realism of the simulated medial meniscal repair. However, it does not compromise our primary intention of looking at lateral meniscal repairs. This is because 90° of knee flexion, as seen in a figure-of-4 position commonly used for lateral meniscal repair, was adequately simulated in our cadaveric study. This is also clinically relevant because posterior horn lateral meniscal repair is the procedure associated with a higher risk of neurovascular injury.

We did not make a tear in the meniscus before the trials. Making a meniscal tear and simulating a repair would likely increase the variability of the results. Our penetration-depth limiter was set to 20 mm and inserted into the meniscocapsular junction to simulate the worst-case scenario of neurovascular injury during a meniscal repair at each penetration trajectory. Our study was limited to the use of only a single device, the FasT-Fix 360 curved needle, only at a penetration-depth limit of 20 mm.

Conclusions

For all-inside meniscal repair, the popliteal vein is at risk and the popliteal artery is at high risk of injury when the posterior horn of the lateral meniscus is repaired via an anterolateral working portal.

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