

# Lateral Knee Compartment Portals: A Cadaveric Study Defining a Posterolateral Viewing Safety Zone

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**Purpose:** This study attempted to define a reproducible “safe zone” based on extra- and intra-articular knee anatomy for placing one or 2 accessory portals in the lateral tibiofemoral compartment for posterolateral region viewing. **Methods:** Standard portals were created in 10 cadaveric knees to enable posterolateral region arthroscopic lateral tibiofemoral joint compartment viewing. After identifying the lateral knee surface tissue “soft spot,” an accessory posterolateral portal (A) was created using an 18-gauge spinal needle and 4-mm cannula under direct visualization of a 70° arthroscope through the anteromedial portal. A second accessory portal (B) was then created 1 cm posterior and 1 cm superior to portal A. Accessory portal locations were measured relative to capsular fold and popliteus tendon locations. Distances from the peroneal nerve, lateral collateral ligament, popliteus tendon, and the biceps tendon were determined. Statistical analysis compared portal location differences from key anatomical structures ( $P < .05$ ). **Results:** Accessory portal A (mean  $\pm$  95% confidence interval) was located  $8.8 \pm 2.7$  mm from the popliteus tendon,  $11.6 \pm 2.7$  mm from the lateral collateral ligament (LCL),  $26.8 \pm 2.3$  mm from the peroneal nerve, and  $4.9 \pm 2.5$  mm from the biceps tendon. Accessory portal B was located  $17.3 \pm 2.8$  mm from the popliteus tendon,  $20 \pm 2.8$  mm from the LCL,  $30.3 \pm 3.3$  mm from the peroneal nerve, and  $7.0 \pm 4.8$  mm from the biceps tendon. Accessory portal B was located a greater distance from the LCL and the popliteus tendon than portal A ( $P < .0001$ ). **Conclusions:** Using intra- and extra-articular anatomic landmarks, both accessory portals could be safely placed in the lateral tibiofemoral joint compartment to enable posterolateral region viewing. Accessory portals used individually or in combination may enable easier posterolateral region viewing for arthroscopic repair of lateral tibiofemoral compartment structures. **Clinical Relevance:** Lateral tibiofemoral compartment portals can be safely created to enable improved visibility for complex arthroscopic procedures in the posterolateral viewing region.

Most knee surgeons rely on anterior portals for arthroscopic visualization and instrumentation. To improve viewing and instrumentation use for procedures such as posterior medial meniscus horn or root repairs in the posteromedial region of the medial tibiofemoral joint compartment, some surgeons have recommended use of an accessory posteromedial

portal.<sup>1-3</sup> Having an accessory portal that enables similar advantages at the posterolateral region of the lateral tibiofemoral compartment and that does not possess substantial injury risk to adjacent anatomic structures might be similarly useful. Safe use of such a portal may facilitate arthroscopic repair of tibial side posterior cruciate ligament avulsions, lateral meniscus horn or root tears, lateral meniscus ramp lesions, all-inside lateral meniscus transplantation, loose body extraction, popliteus tendon repair, or pigmented villonodular synovitis resection under direct visualization.<sup>2-11</sup>

Johnson<sup>12</sup> first described the use of posterior knee portals. Whipple and Bassett<sup>13</sup> reported that it was possible to visualize the posterolateral aspect of the lateral tibiofemoral compartment through an accessory anteromedial portal. The potential for peroneal nerve injury represents one important reason why lateral tibiofemoral compartment portal use has not gained widespread popularity.<sup>14-16</sup> In a study of surgical complications associated with knee arthroscopy, Small<sup>16</sup>

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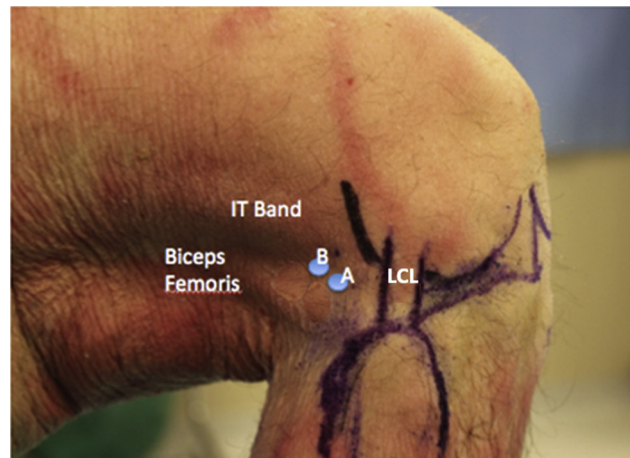
reported a combined nerve injury incidence of 0.06%, with 5% of all cases involving the peroneal nerve. Other investigators have reported an approximately 0.6% nerve injury incidence, with almost half of the cases being related directly to posterior portal placement.<sup>17-19</sup> Previous reports have described peroneal nerve location at the level of the knee and its proximity to posteromedial<sup>1</sup> and posterior or trans-septal<sup>20-22</sup> knee portal placement. Ogilvie-Harris et al.<sup>20</sup> reported that an accessory lateral tibiofemoral compartment portal for posterolateral viewing could be safely positioned at a distance of 1.5 cm from the peroneal nerve with the knee positioned in 90° flexion. A literature search, however, did not identify any previous study that defined the anatomic “safe zone” for lateral tibiofemoral compartment portal placement for posterolateral viewing based on intra- and extra-articular anatomy. This study attempted to define a reproducible safe zone based on extra- and intra-articular knee anatomy for placing one or 2 accessory portals in the lateral tibiofemoral compartment to enable posterolateral region viewing. The study hypothesis was that one or 2 safe zone lateral tibiofemoral compartment accessory portal placement locations would be identified.

## Methods

This research was deemed exempt from the need for institutional medical research board approval. Arthroscopy was performed on 10 knees from 10 cadavers (6 male, 4 female, mean age = 58 ± 4 years). Knee specimens were frozen and thawed for study use within 30 days postharvest. A light embalming process helped maintain soft-tissue color, texture, and mechanical properties for research use.<sup>23</sup> The primary investigator, a senior orthopaedic surgery resident, evaluated cadaveric medical records and each knee specimen prior to study use. For study inclusion, cadaveric specimens had to be ≤ 60 years of age without any visible evidence of injury, disease, or deformity. Cadaveric specimens were excluded if records indicated a cause of death related to metastatic bone disease, lower extremity malignancy, or a previous knee surgery history.

## Surgical Technique

After thawing for 24 hours, knee arthroscopy was performed. Gravity-flow arthroscopic fluid inflow was provided by four 3-L bags suspended approximately 2 m above specimen height. All arthroscopies and dissections were performed with the knee in 90° flexion. Standard anteromedial and anterolateral portals were used to access the lateral tibiofemoral compartment. Using a 30°, 4.0-mm arthroscope (Stryker, Mahwah, NJ) to enable direct observation through the anteromedial portal, a 5.0-mm burr



**Fig 1.** Lateral view of the right knee showing the 2 accessory portal locations. Accessory portal A was created at the lateral soft spot. Accessory portal B was located 1 cm posterior and 1 cm superior to accessory portal A. (IT band, iliotibial band; LCL, lateral collateral ligament.)

inserted through the anterolateral portal was used to perform a 3 to 4 mm inferior lateral femoral condyle notchplasty to better enable instrumentation clearance. Once the lateral meniscus posterior horn was observed, the 30° arthroscope was advanced farther into the lateral tibiofemoral compartment. Leaving the cannula in place in the anteromedial portal, the 30°, 4.0-mm arthroscope was replaced with a 70° arthroscope to obtain a more panoramic posterolateral view around the lateral femoral condyle. An 18-gauge spinal needle was then inserted into the knee to create an accessory lateral tibiofemoral compartment portal (A) for posterolateral region viewing under direct observation from the 70° arthroscope positioned in the anteromedial portal. The initial accessory lateral tibiofemoral compartment portal A was created at the center of the “soft spot” of the skin located over the lateral tibiofemoral compartment.<sup>2</sup> After this, accessory portal B was created 1 cm posterior and 1 cm superior to portal A (relative to the tibial axis with the knee at 90° flexion; Fig 1). The insertion angle of each accessory lateral tibiofemoral compartment portal cannula represented the angle in which the spinal needle entered the knee to avoid lateral femoral condyle articular surface damage (Fig 2). This angle was located approximately 15° anterior from a direct lateral knee approach, or approximately 105° from the anterior aspect of the knee with the needle and portal angled anteriorly. Intra-articular capsular fold and popliteus tendon landmarks were used to guide portal placements so that they were created posterior to the lateral femoral condyle and popliteus tendon, superior to the inferior capsular fold, and anterior to the posterior capsule (Fig 3).

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