

A Simple Method to Avoid Popliteal Artery Injury During Transtibial Posterior Cruciate Ligament Reconstruction

Carlos Eduardo Silveira Franciozi, MD, PhD, BRAZIL
Leonardo José Bernardes Albertoni, MD, BRAZIL
Romeu Krause, MD, BRAZIL
Rene Jorge Abdalla, MD, BRAZIL
Marcelo Krause, MD, BRAZIL
Teodomiro Rodrigues Da Cunha Neto, MD, BRAZIL
Rogério Cabral Duarte Louzada, BRAZIL
Fernando Noel Ribeiro, MD, BRAZIL
Antonio Carlos Moscon, MD, BRAZIL
Marcelo De Azevedo E Souza Munhoz, MD, BRAZIL
Pedro Debieux, MD, BRAZIL
Marcelo Seiji Kubota, BRAZIL

Escola Paulista de medicina - UNIFESP
Sao Paulo, BRAZIL

Summary:

The most feared complication during posterior cruciate ligament reconstruction (PCL) is damage to the popliteal artery. The common method for PCL reconstruction is the transtibial technique using the medial approach, but the lateral approach also exists. This study's purpose is to evaluate the vascular safety of the anterolateral tibial tunnel entry point for the transtibial PCL reconstruction technique.

Abstract:

Purpose:

The most feared complication during posterior cruciate ligament (PCL) reconstruction is damage to the popliteal artery. The common method for PCL reconstruction is the transtibial technique using the anteromedial cortex tunnel entry point, also known as the medial approach. There is a modification of this technique known as the lateral approach, consisting in an anterolateral tibial tunnel entry point. This study intends to introduce the vascular safety of the lateral approach for the transtibial PCL reconstruction technique.

Methods:

Twenty human cadaveric knees were used. After arthroscopic PCL resection and limited posterior capsular release, PCL Tibial Aimer was placed within the PCL footprint through the anteromedial portal in the medial approach and through the anterolateral portal in the lateral approach. The guide angle was set at 55°. For the medial approach (Group A), the drill guide was oriented 45° to the long axis of the tibia and introduced through the anteromedial tibial cortex and the guide wire was advanced with the reamer beyond the posterior tibial cortex. For the lateral approach (Group B), the drill guide was oriented 30° to the long axis of the tibia and introduced through the anterolateral tibial cortex just lateral to the tibial crest and the guide wire was advanced with the reamer beyond the posterior tibial cortex. The knees were dissected by open surgery. Depth distance (DD) was defined as being the distance between the popliteal artery and the tibial posterior cortex projected at the tibial level when the guide wire intersected or passed by the artery. Guide wire travel distance (TD) was defined as being the distance the guide wire progressed beyond the tibial cortex to intersect the popliteal artery. The popliteal artery was divided into 3 regions: lateral, central and medial with reference to the region where the guide wire intersected it. Two specimens were used for illustrative arthroscopic posterior capsule opening and popliteal artery dissection after the passage of medial and lateral guide wires.

Statistical analysis was conducted utilizing summary measures (mean, standard deviation, median, minimum and

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maximum) to describe the linear values evaluated according to each technique and these techniques were compared using the Paired t-Student's test. The intersected region of the popliteal artery was described with the use of absolute and relative frequencies.

Results:

In all specimens the artery was located directly posterior and slightly lateral to the PCL insertion. Group A intersected the popliteal artery in all cases with a mean DD of 12.20mm (median 12.5mm; range 10 to 14mm) and a mean TD of 15.90mm (median 10mm; range 13 to 20mm). Group B did not intersect the artery in any case; its mean medial distance from the artery was 4.8mm (median 5mm; range 4 to 6mm) at a DD of 10.05mm (median 10mm; range 8 to 12mm) with a mean travel distance of 14.15mm (median 14mm; range 12 to 16mm). Paired t-tests showed significant difference in DD and TD ($p < 0.001$ and $p = 0.002$, respectively) between the two groups with greater values in Group A, but with no case of artery intersection in Group B.

Conclusions:

The transtibial PCL reconstruction with a lateral approach is a safer method than the medial approach regarding the popliteal artery vascular security.

Clinical Relevance:

This study presents a slight modification of the most used PCL reconstruction technique intending to avoid its worst complication: damage to the popliteal artery.