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Original Article

Anatomical study of the posterior cruciate ligament with the knee flexed at 90°☆,☆☆

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ABSTRACT

Objective: To study the anatomy of the posterior cruciate ligament (PCL) and define anatomical parameters with the knee flexed at 90°.

Methods: Eight knees from cadavers were dissected in order to make measurements from the center of the anterolateral band to the roof (AL1), from the center of the anterolateral band to the anterior cartilage (AL2), from the center of the posteromedial band to the roof (PM1), from the center of the posteromedial band to the anterior cartilage (PM2), from the center of the tibial insertion to the medial region of the tibia (TIM), from the center of the tibial insertion to the lateral region of the tibia (TIL), from the center of the medial insertion to the medial meniscus (IMM) and the width of the origin of the PCL (WO). To obtain the results from each anatomical structure, the means and standard deviations of the measurements were calculated.

Results: The measurements in millimeters that were found were AL1, 6.2; AL2, 4.9; PM1, 11.7; PM2, 5.5; TIM, 32.5; TIL, 40.6; IMM, 9.4; and WO, 32.5.

Conclusions: The PCL has an extensive origin. The center of the anterolateral band is 6 mm from the roof and 5 mm from the anterior cartilage of the knee. The tibial insertion is slightly medial and 10 mm distal to the posterior cornu of the medial meniscus.

Estudo anatômico do ligamento cruzado posterior com o joelho em 90° de flexão

Palavras-chave:
Ligamento cruzado posterior

RESUMO

Objetivo: Estudar a anatomia do ligamento cruzado posterior (LCP) e definir parâmetros anatômicos com o joelho em 90° de flexão.

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Anatomia
Cadáver

Métodos: Oito joelhos de cadáveres foram dissecados para tirar as medidas do centro da banda anterolateral ao teto (AL1), do centro da banda anterolateral à cartilagem anterior (AL2), do centro da banda posteromedial ao teto (PM1), do centro da banda posteromedial à cartilagem anterior (PM2), do centro da inserção tibial à região medial da tíbia (ITM), do centro da inserção tibial à região lateral da tíbia (ITL), do centro da inserção medial ao menisco medial (IMM) e da largura da origem do LCP (LO). Para a obtenção dos resultados de cada estrutura anatômica foram calculados os valores de média e desvio padrão das medições.

Resultados: As medidas, em milímetros, encontradas foram AL1, 6,2; AL2, 4,9; PM1, 11,7; PM2, 5,5; ITM, 32,5; ITL, 40,6; IMM, 9,4; e LO, 32,5.

Conclusões: O LCP tem uma origem extensa. O centro da banda anterolateral fica a 6 mm do teto e a 5 mm da cartilagem anterior do joelho. A inserção tibial fica levemente medial e 10 mm distal ao corno posterior do menisco medial.

Introduction

The posterior cruciate ligament (PCL) is one of the static stabilizers of the knee. It provides primary restraint in relation to posterior displacement of the tibia and secondary restraint in relation to varus, valgus and external rotation.[1]

Controversy continues regarding the treatment for PCL injuries.[2] There is insufficient data in the literature to be able to standardize the indication.[3] Some authors have recommended reconstruction of the PCL in patients with more than 10 mm of posterior displacement who present complaints of pain and instability and who do not improve with conservative treatment.[2,4] This recommendation is based on the fact that 75% of the results from PCL reconstruction are good.[5]

No technique presenting precision and reproducibility for guiding tunnel positioning in PCL reconstruction has yet been developed. This may be because most studies have been conducted with the knee in the anatomical position (extension), whereas the surgical procedure is performed with the knee flexed.[6–8] The aim of this study was analyze the anatomy of the PCL and define objective anatomical parameters with the knee flexed at 90°.

Materials and methods

Eight knees from cadavers were dissected with the aim of studying the anatomy and making measurements on the structures and anatomical relationships of the PCL.

As an inclusion criterion, we selected knees from cadavers with intact knee structures, including the joint capsule, without any previous arthrotomy. All the knees had been conserved in formol.

To make measurements, 40 × 12 needles were used to mark out specific points and then an Aero Space® metal pachymeter (150 mm) was used.

The following measurements were made:

- center of the anterolateral band to the roof (Fig. 1);
- center of the anterolateral band to the anterior cartilage (Fig. 1);
- center of the posteromedial band to the roof (Fig. 1);
- center of the posteromedial band to the anterior cartilage (Fig. 1);
- center of the tibial insertion to the medial region of the tibia (Fig. 2);
- center of the tibial insertion to the lateral region of the tibia (Fig. 2);
- center of the medial insertion to the medial meniscus (Fig. 2);
- width of the origin of the PCL (Fig. 3).

One of the measurements was the width of the origin of the PCL. This was measured with the aid of a colored string, which was laid along the entire length of the ligament (Fig. 3).

Results

The means and standard deviations (SD) resulting from the measurements on the PCL at the femoral origin and tibial insertion are presented in Tables 1 and 2.

Discussion

Most studies have measured the cruciate ligaments in the anatomical position, i.e. with the knee extended. These measurements have been based on the sagittal view, with removal of the femoral condyle.[8] In the present study, the anatomical measurements were made with the knee flexed at 90°, with the intention of increasing the applicability of the study to arthroscopic procedures.[6] Even with similar measurements, the results may show discrepancies if obtained in different manners.[7,8]

The PCL originates from a large area of the medial femoral condyle and is inserted in a depression between the tibial plateaus called the fossa of the PCL.[1] It is slightly medial to the imaginary axis of knee rotation.[9] The results from anatomical studies on the tibial insertion of the PCL corroborate this affirmation. Lorenz et al.[10] found the center of the tibial insertion 45 mm from the lateral edge of the tibial plateau and 43 mm from the medial edge. The results from the present