Anatomical and Computed Tomographic analysis of the Femoral Attachment of the Posterior Cruciate Ligament

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Introduction

Accurate and anatomic tunnel placements are important aspect to success the reconstruction of the posterior cruciate ligament (PCL). Although many studies have provided information about the femoral footprint of the PCL, there are few studies detailed anatomical evaluations of the bony landmarks for PCL reconstruction)1). That might be the reason why there is a lack of defined reference points for reproducible femoral tunnel for PCL reconstruction. The objective of this study was to define the bone morphology of the femoral attachment areas of PCL in cadaveric knees. To define the bony landmarks, we examined the Computed Tomography (CT) scan and CT number was measured that we previously reported about the femoral attachment of anterior cruciate ligament (ligement). The anatomy of the PCL has been described in several studies. However, few studies about the details of the bone anatomy related to the femoral footprint of the PCL. It was important for surgeons to know about relation between attachment of PCL and bony landmark. In this study, we demonstrated that femoral insertion of the PCL has two ridges frequently, which is include the distal prominence of the two ridges located slight proximally footprint of the PCL and the proximal prominence of the two ridge located proximal edge of footprint of the PCL. The CT number of the bony ridge was higher than that of the other zone in this study. This is indicated that PCL attachment was easily visualized using 3D reconstruction software and the higher bone quality in PCL attachment may be help the surgeons where make bone tunnel.

Material and Methods

18 human cadaveric knees from the anatomical course of medical students at Osaka city university medical school of medicine, Osaka, Japan were used. The cadaver’s knee had slightly cartilage damages but PCL intact. The age range was 70-86 years. Distal femur was extract and all tissue except the PCL was removed. CT examination of the all distal femur was performed with a helical CT machine and reconstructed using three-dimensional (3D) reconstruction software (AzeLtd.,Japan) and prepare the slices 3-mm thick vertically to PCL insertion and analyzed by radiograph.

Result

In radiograph, three types of the shape at the medial wall of PCL attachment were identified, that is one ridge type, two ridges type and flat type (fig1). One ridge type were found 66.7%, 38.9 %, 22.2%, 33.3% and 50% in group A, B, C, D and E. Two ridges were found 22.2%, 61.1%, 77.8%, 61.1%, and 44.4% and flat were 11.1%, 0%, 0%, 5.6% and 5.6% in group A, B, C, D and E. The average height of the ridge were 0.60, 0.66, 0.76, 0.75 and 0.45mm in group A, B, C, D and E. The average distance from articular cartilage edge to center of osseous prominence and attachment of PCL were measured. At CT analysis, six zones around the PCL insertion were defined and 10 point of CT value in each area were measured and analyzed.

Discussion

The anatomy of the PCL has been described in several studies. However, few studies about the details of the bone anatomy related to the femoral footprint of the PCL. It was important for surgeons to know about relation between attachment of PCL and bony landmark. In this study, we demonstrated that femoral insertion of the PCL has two ridges frequently, which is include the distal prominence of the two ridges located slight proximally footprint of the PCL and the proximal prominence of the two ridge located proximal edge of footprint of the PCL. The CT number of the bony ridge was higher than that of the other zone in this study. This is indicated that PCL attachment was easily visualized using 3D reconstruction software and the higher bone quality in PCL attachment may be help the surgeons where make bone tunnel.

References

1) Y.Hashimoto. Anatomical and Computed Tomographic analysis of Femoral Attachment of Anterior Cruciate Ligament : Trans of ORS 54th 2008 pp1237