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Original Article

Study on the relationship between the thickness of the anterior cruciate ligament, anthropometric data and anatomical measurements on the knee☆

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ABSTRACT

Objectives: To ascertain thickness measurements on the anterior cruciate ligament (ACL) in its middle third on magnetic resonance imaging (MRI) scans and to assess whether there is any association between variations in ligament thickness and patients' heights and ages, along with variations in the anatomical measurements on the knee.
Methods: MRI scans on 48 knees were evaluated. The anteroposterior size of the femoral condyles, interepicondylar distance, intercondylar distance and anteroposterior and mediolateral thicknesses of the ACL were measured. It was assessed whether there was any statistical relationship between ACL thickness and the patients' age, height or other measurements evaluated.
Results: The mean thickness of the middle third of the ACL was 4.5 mm in the sagittal plane and 4.3 mm in the frontal plane. The anteroposterior thickness of the ACL in its middle third had a positive relationship with the size of the lateral condyle. The mediolateral thickness of the ACL in its middle third had a positive relationship with the size of the lateral condyle and with the intercondylar distance in the axial plane. There was no relationship between the thickness of the ACL and the patients' age or height.
Conclusion: The thickness of the ACL presented positive associations with the size of the lateral femoral condyle and the intercondylar distance.

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Estudo da relação entre a espessura do ligamento cruzado anterior, os dados antropométricos e as medidas anatômicas do joelho

Palavras-chave:
Joelho
Ligamento cruzado anterior
Anatomia
Imagem por ressonância magnética

RESUMO

Objetivo: Obter as medidas da espessura do ligamento cruzado anterior (LCA) em seu terço médio em exames de ressonância magnética e avaliar se existe associação entre a variação da espessura do ligamento com a altura e a idade dos pacientes, bem como com as variações das medidas anatômicas do joelho.

Métodos: Foram avaliados os exames de ressonância magnética de 48 joelhos, aferidas as medidas do tamanho anteroposterior dos côndilos femorais, distância interepicondilar, distância intercondilar e as espessuras anteroposterior e mediolateral do LCA e avaliamos se existe relação estatística entre a espessura do LCA e a idade ou a altura dos pacientes e as demais medidas avaliadas.

Resultados: A média da espessura no terço médio do LCA foi de 4,5 mm no plano sagital e 4,3 mm no plano frontal. A espessura anteroposterior do LCA no seu terço médio tem relação positiva com o tamanho do côndilo lateral. A espessura mediolateral do LCA no seu terço médio tem relação positiva com o tamanho do côndilo lateral e com a distância intercondilar no plano axial. Não encontramos relação entre a espessura do LCA e a idade ou a altura dos pacientes.

Conclusão: A espessura do LCA apresenta uma associação positiva com o tamanho do côndilo femoral lateral e a distância intercondilar.

Introduction

Reconstruction of the anterior cruciate ligament (ACL) is one of the surgical procedures most frequently performed within orthopedists' clinical practice and its results are well established in the literature.[1–6] Lack of success in reconstructing the ligament is related to poor positioning of the tunnels, non-treatment of associate lesions and problems relating to fixation and incorporation of the graft, along with inappropriate rehabilitation protocols.[7]

Recently, Magnussen et al.[8] correlated the diameter of the graft used with failure of ACL reconstruction. According to these authors, grafts with diameters less than or equal to 8 mm had a higher repeated tear rate than did grafts with diameters greater than 8 mm. Thus, the authors suggested that reconstructions should be performed with grafts of minimum thickness 9 mm.

Despite the advantage relating to using grafts that are as thick as possible, complications in standardizing this characteristic may lead to a disproportionate increase in the ratio between content and containment structure in the knee. This may generate pain, limitation of the range of motion and increased risk of failure of the reconstruction.[7,9]

Investigation of parameters that enable individualized surgical planning may improve the efficacy of treatment and diminish the risk of intercurrences during the intraoperative period. Factors predicting the graft that should be used in reconstructing the ligament are among these parameters Evaluation of the morphology of the ACL and its relationship with the anthropometric data and with the other structures of the knee may provide guidance of greater precision and lower risk in choosing the thickness of the graft to be used in ligament reconstruction surgery.[10]

The aims of this study were to obtain thickness measurements from the middle third of the ACL, using magnetic resonance imaging (MRI) examinations, and to assess whether there was any association between the variation in ligament measurements and patients' height and age, and also in relation to variations in anatomical measurements on the knee.

Methods

This was a retrospective study that had been approved by the Research Ethics Committee of Santa Casa de São Paulo. Forty-eight MRI examinations on the knees of patients who were being followed up at the Knee Group outpatient clinic of Santa Casa de São Paulo were evaluated. There were 25 examinations on women and 23 on men, and they were performed between January and December 2013.

The ages and heights of the patients examined were recorded. For the height measurements, the patients stood against a stadiometer in an erect manner, with arms extended along the sides of the body and head raised, without wearing shoes. The patients' mean age was 44.3 years and their mean height was 1.70 m.

Patients with skeletal immaturity, previous surgery or degenerative alterations in the knees were excluded.

The images were obtained in the Imaging Diagnostics Service of Santa Casa de Misericórdia de São Paulo, using an MRI machine of 1.5 T (Intera, Philips), with a specific eight-channel coil. Proton density(PD) weighted sequences in three planes (sagittal, coronal and axial) were used, with and without fat