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Original Article

Radiological analysis on femoral tunnel positioning between isometric and anatomical reconstructions of the anterior cruciate ligament☆,☆☆

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ABSTRACT

Objective: the aim of this study was to radiologically evaluate the femoral tunnel position in anterior cruciate ligament (ACL) reconstructions using the isometric and anatomical techniques.

Methods: a prospective analytical study was conducted on patients undergoing ACL reconstruction by means of the isometric and anatomical techniques, using grafts from the knee flexor tendons or patellar tendon. Twenty-eight patients were recruited during the immediate postoperative period, at the knee surgery outpatient clinic of FCMMG-HUSJ. Radiographs of the operated knee were produced in anteroposterior (AP) view with the patient standing on both feet and in lateral view with 30° of flexion. The lines were traced out and the distances and angles were measured on the lateral radiograph to evaluate the sagittal plane. The distance from the center of the screw to the posterior cortical bone of the lateral condyle was measured and divided by the Blumensaat line. In relation to the height of the screw, the distance from the center of the screw to the joint surface of the lateral condyle of the knee was measured. On the AP radiograph, evaluating the coronal plane, the angle between the anatomical axis of the femur and a line traced at the center of the screw was measured.

Results: with regard to the *p* measurement (posteriorization of the interference screw), the tests showed that the *p*-value (0.4213) was greater than the significance level used (0.05); the null hypothesis was not rejected and it could be stated that there was no statistically significant difference between the anatomical and isometric techniques. With regard to the H measurement (height of the screw in relation to the lower cortical bone of the knee), the *p*-value observed (0.0006) was less than the significance level used (0.05); the null hypothesis was rejected and it could be stated that there was a statistically significant difference between the anatomical and isometric techniques. It can be concluded that the

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latter difference occurred because the isometric technique generated greater values for the H measurement than the anatomical technique. With regard to the MED variable (position of the screw on the AP radiograph), the observed *p*-value (0.000) was less than the significance level (5%); the null hypothesis was rejected and it could be stated with 95% confidence that there was a significant difference between the anatomical and isometric techniques.
Conclusions: there were statistically significant differences in the radiological evaluations of the femoral tunnel, both in the sagittal and in the coronal plane, between the ACL reconstruction techniques.

Análise radiológica do posicionamento do túnel femoral com as técnicas de reconstrução isométrica ou de reconstrução anatômica do LCA

RESUMO

Objetivo: avaliar radiologicamente a posição do túnel femoral na reconstrução do ligamento cruzado anterior pelas técnicas isométrica e anatômica.
Métodos: foi feito estudo analítico prospectivo em pacientes submetidos à reconstrução do ligamento cruzado anterior (LCA), por meio da técnica isométrica e anatômica, com o uso de enxerto de tendões flexores do joelho ou de tendão patelar. Foram captados 28 pacientes, em pós-operatório imediato, no ambulatório de cirurgia do joelho da FCMMG-HUSJ. Foram feitas radiografias do joelho operado nas incidências em anteroposterior (AP) com apoio bipodálico e perfil em 30° de flexão. Foram traçadas as linhas e medidos os ângulos e as distâncias na radiografia em perfil para avaliar o plano sagital. Foi medida a distância do centro do parafuso à cortical posterior do côndilo lateral e dividido pela linha de Blumensaat. Com relação à altura do parafuso, foi medida a distância do centro dele até a superfície articular do côndilo lateral do joelho. Na radiografia em AP, que avalia o plano coronal, mede-se a angulação entre o eixo anatômico do fêmur e uma linha traçada no centro do parafuso.
Resultados: pelos testes, o p-valor (0,4213) é maior do que o nível de significância adotado (0,05), a hipótese nula não é rejeitada e pode ser afirmado que não há diferença estatisticamente significativa entre as técnicas anatômica (TAN) e isométrica (TIS) no que diz respeito à Medida P (posteriorização do parafuso de interferência). Como o p-valor (0,0006) observado é menor do que o nível de significância adotado (0,05), rejeita-se a hipótese nula e pode ser afirmado que há diferença estatisticamente significativa entre a TAN e a TIS no que diz respeito à Medida H (altura do parafuso em relação à cortical inferior do joelho). Pode-se concluir que essa diferença ocorre porque a TIS gera valores maiores para a Medida H do que a TAN. Como o p-valor observado (0,000) é menor do que o nível de significância (5%), rejeitou-se a hipótese nula e afirmamos com 95% de confiança que há diferença significativa entre a TAN e a TIS no que diz respeito à variável MED (posição do parafuso na radiografia em AP).
Conclusões: houve diferença estatisticamente significativa na avaliação radiológica do túnel femoral, tanto no plano sagital como no coronal, entre as técnicas de reconstrução do LCA.

Palavras-chave:
Joelho
Ligamento cruzado anterior
Procedimentos cirúrgicos reconstrutivos

Introduction

Reconstruction of the anterior cruciate ligament (ACL) is one of the most frequently performed orthopedic surgical procedures and it particularly affects young adults. It has been estimated that between 75,000 and 100,000 such procedures are carried out in the United States every year.[1] Reestablishment of knee biomechanics is the main objective of the treatment, in order to avoid early degenerative alterations, with consequent reduction in work capacity and sports performance.

Over recent decades, the arthroscopic procedure of intra-articular ACL reconstruction has been considered to be the gold standard treatment because of its low morbidity, with better and faster postoperative evolution.

In the 1990s, it was believed that the isometric arthroscopic reconstruction technique for the ACL, in which the neoligament maintains its length throughout the range of motion of the knee, would more adequately restore the biomechanics of this joint. This was achieved by constructing the femoral tunnel at an orientation of close to 12 o'clock, which would make the graft vertical. Although this concept was partially true, with restoration of translational stability, a recent study revealed a failure to reach rotational stability, with maintenance of the pivot shift.[2] Consequently, the joint biomechanics was seen not to have been restored, which would generate early signs of osteoarthrosis.