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## Tibiofemoral Kinematic Study of ACL Rupture Using MRI

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### Introduction

This study was performed to assess the tibiofemoral kinematics of patients with anterior cruciate ligament rupture of the knee joint and to compare them with their normal side.

### Material and Methods

By applying open magnetic resonance imaging (MRI), tibiofemoral motion was assessed in 10 patients with a unilateral anterior cruciate ligament rupture. The sagittal images of both knee joint according to the flexion angle (0, 30, 60, 90, 120) without weight-bearing were obtained and the degree and pattern of the tibiofemoral translation were examined. To characterize the route of the tibiofemoral translation, on the sagittal images of the central area of medial condyle and lateral condyle of the affected side as well as normal side, the change of the location of the posterior condyle against the tibia was assessed. The location of the posterior condyle was assessed by the distance from the posterior cortex of the same side tibia to the flexion facet center (center of concentric circles that fit the medial and lateral femoral condyle).

### Result

In the normal side, according to the knee joint flexion, the posterior translation of the posterior condyle was detected, the average lateral condyle was 20 mm, the medial condyle was 6 mm, and the translation of the lateral condyle was evident. In the side with the anterior cruciate ligament rupture, under the complete extension condition, due to the anterior subluxation of the tibia, both femoral condyles were located at the posterior area of the tibia in comparison with the normal side, the degree was 7 mm in the lateral condyle and 3 mm in the medial condyle, and the degree was larger in the lateral condyle. In addition, in regard to the degree of the translation of the posterior condyle to posterior cortex of tibia according to the progression of flexion, the medial side was 4 mm that is not different from normal side ( $p > 0.05$ ), but the lateral side was 16 mm, and significantly shorter posterior translation was detected ( $p < 0.05$ )! .

### Conclusion

In patients with anterior cruciate ligament rupture, the posterior translation of the femur was more evident in the lateral side, and as the flexion progresses, the posterior translation of the lateral condyle of femur becomes smaller and the axial rotation did not reach the normal level.

In conclusion, anterior cruciate ligament rupture appears to cause the abnormal kinematic pattern. However, the research under the weight-bearing condition may be required in future.

**Key word:** ACL rupture, Tibiofemoral kinematics, MRI

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