전방십자인대 재건술시 슬관절 굴곡 및 대퇴 횡 고정핀 삽입각도가 후외측 구조 와 외측 고정 길이에 미치는 영향

Influence of knee flexion and femoral cross-pin insertion angle on PL structures of knee and lateral fixation lengths during ACL reconstruction

고려대학교 안산병원, 인제대학교 서울백병원[1]

이용석 · 김진구[1] · 라호종[1] · 하정구[1] · 이재문 · 변준성

INTRODUCTION

Femoral Cross-pin (RIGIDfix system®: Mitek, Johnson & Johnson, USA) is inserted around lateral epicondyle of femur in anterior cruciate ligament (ACL) reconstruction. It has a potential for posterolateral (PL) structure injury and the lateral fixation length of cross-pin (the distance from lateral wall of femoral tunnel to lateral cortex of femoral condyle) can be changed according to the various angles of knee flexion and cross-pin insertion. The hypotheses of this study were that there will be dangerous angles of knee flexion and cross-pin insertion for the PL structure injury and the lateral fixation length will be too short for the cross-pin fixation at the specific condition.

MATERIALS and METHODS

In 10 fresh cadaveric knees, soft tissues were dissected until lateral collateral ligament (LCL) and popliteus tendon (PT) were identified. A tibial tunnel (8 mm diameter) was made and trans-tibial femoral tunnels (1:30 or 10:30 O'clock position) were made at 3 different knee flexion angles (70°, 90°, and 110°). The cross-pin guide was inserted sequentially at 3 different femoral tunnels, and 2 cross-pin guidewires (superior and inferior pin) were drilled at 3 different insertion angles (downward 30°, 0° (parallel to floor line), and upward 30°) per each position of the knee flexion. The distances from insertion point of 2 cross-pins to LCL and PT and the distance from lateral wall of femoral tunnel to lateral cortex of femoral condyle were measured. The measurements were taken twice by two orthopedic surgeons to reduce the intra-and inter-observer bias.

RESULTS

The inter-rater and intra-rater reliability ranged from 0.82 to 0.91. There were no significant differences in the superior and inferior pin depths ($p=0.56$ and 0.39). The distances from superior pin to LCL and from the inferior pin to LCL were significantly shorter in all knee flexion with 0° and upward 30° insertion angle than 70° and 90° knee flexion with downward 30° insertion angle, respectively ($p<0.05$). There was no significant difference in the distance between superior pin and PT ($p=0.25$). The distance from inferior pin to PT was only enough in the 70° knee flexion with 30° downward insertion angle and significantly longer than most other conditions ($p<0.05$). The length was shorter in all 3 angles of knee flexion with 0° insertion angle than other conditions.

CONCLUSIONS

The cross-pin was closely inserted to the LCL, and PT, and the 0° insertion angle should be avoided because it could cause LCL or PT injury in all angles of knee flexion. Lateral fixation length was relatively enough for the cross-pin fixation in the 10:30 or 1:30 positioned femoral tunnel.