Knee Stability Before and After Anterior Cruciate Ligament Release in Unicompartmental and Total Knee Arthroplasty

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Unicompartmental knee arthroplasty (UKA) generally is considered to be kinematically superior to total knee arthroplasty (TKA), but to be highly dependent on the anterior cruciate ligament (ACL) to perform as a nearly-normal knee. The specific role played by the ACL in knee kinematics after UKA is not known. This study tested three hypotheses: (1) After UKA the knee is close to normal. (2) Loss of the ACL destabilizes the knee after UKA. (3) Posterior cruciate ligament-retaining TKA performs similarly to an ACL-deficient UKA.

Methods

Six cadaveric knee specimens were tested for stability using a knee-kinematics testing device at 0°, 30°, 60°, 90°, 120° and maximum flexion under axial load of 35N, 10 Nm torque in varus-valgus, 10Nm torque in internal-external rotation, and 50N anterior and 50N posterior load.

After each intact knee was tested, UKA (Symmetric) was done on the medial compartment of each knee (Fig 1). After stability testing the ACL was released to mimic ACL deficiency and all tests were repeated. Finally, TKA (Profix) was done and all tests were repeated (Fig 2).
**Results**

Normal knees and knees with UKA had similar laxity characteristics. Laxity was statistically significantly greater in knees after TKA than in the normal knees and those with an intact ACL after UKA (p<0.05) (Figs 3-5). ACL-deficient UKAs were similar to TKAs in stability characteristics. The knee after UKA had normal stability characteristics. Release of the ACL caused increased AP laxity at 30° flexion. TKA caused little change in stability. The knee was similar to an ACL-deficient UKA.

![Figure 3: Varus-Valgus Deflection](image1)

![Figure 4: Rotational Deflection](image2)

![Figure 5: Anteroposterior Deflection](image3)

**Conclusions**

These results confirm the hypothesis that the knee has nearly normal stability characteristics after UKA, and that these characteristics depend on an intact ACL. Loss of the ACL caused modest increase in anterior laxity, but did not cause major disruption of knee function. The ACL is helpful for a stable UKA, but kinematics are not affected severely if it is absent.

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