Femoral component rotation in four different kinds of gap techniques including navigation in TKA

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Introduction: The femoral component rotation is very important factor that affects flexion stability, tibiofemoral and patellofemoral kinematics in TKA. However, it is still unclear which position the femoral component should be placed on the basis of anatomic landmark and how accurately it is reproducible when we perform TKA using various gap techniques. In this study we performed TKAs using four different kinds of gap techniques and obtained computed tomography scans postoperatively. We analyzed the results of the femoral component rotation to the clinical transepicondylar axis and compared those according to the various gap technique methods.

Materials & Methods: We collected the data of the patients who were diagnosed as primary degenerative arthritis of the knee and recieved TKAs using gap technique retrospectively. Four different kinds of gap technique were used. We used the gravity of the lower leg in group 1, tensor device in group 2, gap block in group 3 and tensor device with navigation in group 4, respectively. 50 TKAs were included in each group and total 200 TKAs were included. The groups were matched according to age, sex, range of knee motion and clinical scores. All the procedures of the operation were performed in the same manner. It was excluded that the angle between tibial cut surface and perpendicular line to tibial mechanical axis was more than one degree because it could affect the femoral component rotation significantly. 3-dimensional computed tomography was obtained after the operation and the angle between the posterior condylar axis of femoral component and clinical transepicondylar axis was evaluated. The outlier was defined as excessive external or internal rotation over 3 degrees. The severe outlier was defined as that over 5 degrees.

Results: The femoral component of all 200 TKAs was rotated slightly internally but nearly parallel to the clinical transepicondylar axis (-0.27°±2.9°). In group 1, 3, 4 the femoral component were rotated internally (-0.92°±2.5°, -0.68°±2.7°, -0.73°±3.4°). However, in group, 2 the femoral component was rotated externally (1.24°±2.7°, $p<0.001$). The frequency of outlier was 22% in total. In group 4, the frequency of outlier was highest (16% in group 1, 20% in group 2, 24% in group 3 and 28% in group 4). The frequency of severe outlier was 7% in total. In group 4, the frequency of severe outlier was highest also (6% in group 1, 4% in group 2, 6% in group 3 and 12% in group 4).

Conclusion: The rotation of femoral component in TKA of various gap techniques including navigation was nearly parallel to the clinical transepicondylar axis. In the 3 methods including navigation except the tensor device method the femoral component was rotated slightly internally, however, it was rotated externally in the tensor device method. The frequencies of outlier were similar in the 3 methods including navigation except the gap block method. However, it was highest in the gap block method and surgeon should take it into consideration. With the use of the navigation system, we obtained satisfactory result of femoral component rotation similar to the other gap methods in the mean value and the frequency of outlier.