Which Rotational Reference for Tibial Component is optimal in Total Knee Arthroplasty?

+1 Mitsuyasu, H; 1Matsuda, S; 1Fukagawa, S; 1Miura, H; 1Okazaki, K; 1, 2Tashiro, T; 1Kawahara, S; 1Iwamoto, Y
1Department of Orthopaedic Surgery, Graduate School of Medical Sciences, Kyushu University, Fukuoka City, Japan
2Department of Advanced Medicine and Innovative Technology, Kyushu University Hospital, Fukuoka, Japan
mazi@ortho.med.kyushu-u.ac.jp

INTRODUCTION:
The rotational mismatch between the femoral and tibial components of the knee is an important determinant of overall function for total knee arthroplasty (TKA). During TKA, the rotational alignment of the femoral and tibial components is usually determined by bony landmarks. Numerous authors have advocated the transepicondylar axis (TEA), as a reproducible and reliable reference axis in femur. However, the optimal rotational position of the tibial component is unclear. To our knowledge, there is no study about the rotational mismatch between the femoral and tibial components using postoperative computed tomography (CT). The aim of this study was to investigate the effect of the tibial component rotational angle on the rotational mismatch in the patients with well-aligned femoral component from preoperative and postoperative CT.

METHODS:
We evaluated 40 knees in 33 patients underwent a primary TKA for treatment of osteoarthritis. The patient population comprised 31 women and 2 men with age of 75.9 ± 4.7 (range 65 – 84). All operations were performed with a posterior-stabilized design (NexGen Legacy, Zimmer, Warsaw, IN). In this study, we defined the rotational mismatch as an angle between the anteroposterior (AP) axis of the tibial component and the perpendicular line to TEA in order not to be affected by the influence of the femoral component position. Therefore, we excluded the patients that the femoral component rotational angle were > 3˚ and < -3˚ to TEA.

For computed tomography scans, the patient was placed in the supine position on a table and the knee was extended. Axial CT images of whole tibia, including knee and ankle joint, were obtained using a 2.0 mm section thickness for all subjects. We analyzed the computed tomography scan data using 3D imaging software (3D template version 02.02.02, Japan Medical Materials Corporation, Osaka, Japan).

RESULTS:
The rotation angle between Tibial AP Axis and TEA perpendicular axis changed from -1.1 ± 5.2 (-11.3 ° ~ 9.3 °) preoperatively to -3.4 ± 6.7 ° (-14.1 ° ~ 13.7 °) postoperatively (p < 0.0001). A significant correlation was detected between the tibial component rotation angle and the rotational mismatch to TEA. More internally rotated the tibial component, more internally rotational mismatch was found between the tibial component and TEA (Fig. 2).

DISCUSSION:
To our knowledge, this is the first study to evaluate the effect of the tibial component position on the rotational mismatch of the knee joint. Results of this study showed that when the tibial component was rotated more internally, more rotational mismatch occurred between the tibial component and TEA. In addition, even if the tibial component was placed in the optimal position, a certain degree of rotational mismatch might occur in extension when the symmetric tibial component was used. One of the reasons would be that some of the functions in the normal knee were not reproduced after TKA, such as so-called “screw-home movement” in extension.

REFERENCES: