

## The Flexion Gaps and the Femoral Component Rotation are Different Among Various Gap Balancing Techniques

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### Summary:

This RCT revealed that gap technique with gravity and gap technique with tensor device of 20lb were more accurate and reliable method to obtain the symmetric flexion gap than spacer block method.

### Abstract:

#### Background:

The adequate femoral component rotation is one of the most important factors in successful total knee arthroplasty (TKA) and dictated by the estimated flexion gap when the gap-balancing technique is used during the procedure. We hypothesized that different gap techniques results in unequal flexion gaps and the femoral component rotations. In this prospective study we used three different kinds of gap techniques and analyzed the symmetry of flexion gap measured intraoperatively. The purpose of the study was to evaluate the difference of the flexion gaps and the femoral component rotations among different gap techniques.

#### Methods:

One hundred and fifty TKAs were randomly allocated into one of three groups. In the gravity group, flexion gap was measured using the gravity of the patient's lower leg. In the tensor group, a gap tensioning device which was set at 20lb was used. In the block group, the spacer blocks of various thickness were used. There was no difference in age, gender difference, BMI and clinical status among groups preoperatively. The medial and lateral flexion gap asymmetry was measured as the angle between the cut surface of the tibia and posterior cut surface of the femur after osteotomy during the procedure by the tensor/balancer. The flexion gap asymmetry outlier was defined as the angle more than 3 degrees. The femoral component rotation was measured on CT postoperatively and compared with the clinical transepicondylar axis (TEA). The femoral component rotation outlier was defined as the difference from clinical TEA more than 3 degrees.

#### Results:

The flexion gap asymmetry was  $0.10 \pm 1.58^\circ$  in the gravity group,  $-0.38 \pm 1.48^\circ$  in the tensor group and  $-2.26 \pm 2.05^\circ$  in the block group (+: medial gap > lateral gap, -: lateral gap > medial gap). The flexion gap asymmetry in the block group differed from those in Groups 1 and 2 ( $p < 0.001$ ), although there was no statistical difference between the gravity group and the tensor group ( $p = 0.497$ ). The outliers were also more frequent in the block group (10% in Group 1, 16% in Group 2 and 50% in Group 3,  $p = 0.001$ ). The mean femoral component rotation was  $-0.74 \pm 1.88^\circ$  in the gravity group,  $-0.43 \pm 2.36^\circ$  in the tensor group and  $-2.62 \pm 2.55^\circ$  in the block group (all internal rotation of the component compared to cTEA). The rotation in the block group was different from those in the gravity group and the tensor group ( $p < 0.001$ ), although there was no statistical difference between the gravity group and the tensor group ( $p = 1.000$ ). The outliers were more frequent in the block group (10% in Group 1, 16% in Group 2 and 40% in Group 3,  $p = 0.001$ ). There was weak positive correlation between the flexion gap and the femoral component rotation ( $r = 0.235$ ,  $p\text{-value} = 0.004$ ).

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### Conclusion:

This prospective randomized controlled study revealed that gap technique with gravity and gap technique with tensor device of 20lb were accurate and reliable method to obtain the symmetric flexion gap and adequate femoral component rotation. We must be careful when using gap technique with block.