Does the reducing femoral component in PS-TKA using computer-assisted surgery has no impact on the extension gap? A cadaveric study

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Introduction: Success of total knee arthroplasty (TKA) should be performed to proper mechanical alignment and knee stability in flexion and extension (1, 2). Unfortunately, the distal femur might mismatch either anteroposterior -mediolateral or flexion -extension gap that led to reduce size of femoral components by surgeon. This technique could be increased flexion gap but had no impact on extension gap (3). The authors hypothesized that bone loose in posterior femoral condyle may increase in extension gap due to posterior capsule and soft tissue loosen.

The purpose of this study was to evaluate the effect of reducing femoral component to extension gap in posterior-stabilizer total knee arthroplasty (PS-TKA) using computer assisted surgery (CAS) in Thai cadaveric knees.

Methodology: This study performed TKA in 10 normal knee of fresh Thai cadaver, mean age 56.4 ± 9.3 years (47 to 69 years). The standard tibia first gap balancing technique PS-TKA (PS Mobile, B. Braun Aesculap, Germany) was performed by a single surgeon (NR) in all cadavers using medial parapatellar approach. After tibia and femoral bone were cut completely, the femoral component was inserted. Then, the patellar was everted and measured the extension and 90° flexion gap (1) using CT-free navigation system (OrthoPilot 4.2; B. Braun Aesculap, Germany) and double-piston tension device(4) (Knee Balancer, DePuy, Warsaw, IN, USA) to maintain consistent pressure. Subsequently, the authors performed to downsize femoral bone cut- one size, and inserted femoral component. Finally, the extension and flexion gap were recorded again. All data were calculated the average of difference and compare relation before and after downsize femoral component in each gap.

Result: The mean increase of extension gap on the medial and lateral sides after downsize of femoral component were 1.0 ± 0.06 mm (0.0 - 3.0 mm) and 0.50 ± 0.92 mm (-1.0 - 2.0 mm) respectively. The mean increases of flexion gap on the medial and lateral sides after downsize of femoral component were 1.0 ± 0.06 mm (0.0 - 3.0 mm) and 1.25 ± 1.28 (-1.0 - 3.0 mm) respectively.

Both medial and lateral sides of flexion gap were significantly increased after downsize of femoral component ($p \leq 0.05$). On extension gap, only medial side was significantly increased after downsize of femoral component ($p \leq 0.05$).

Conclusion: When the femoral component was reduced, this presented increase laxity of both flexion and extension gaps due to cutting posterior bone and soft tissue tightness and/or tension effect. Surgeons should be aware of this effect to downsizing intraoperative that lead to medial extension laxity. Thus, this effect also impact on postoperative instability of TKA. In the future, larger sample size will be study to guarantee a test.

Reference

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