

Limited flexion of the femoral component may serve as a tool to manage the flexion gap in navigated total knee arthroplasty

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Background: The symmetry and equality of the flexion and extension gap are essential for successful endoprosthetic knee arthroplasty. The navigated technique offers the possibility to measure and visualize the extension and flexion gap precisely. While the extension gap can smoothly be defined by the amount of distal femoral resection, the flexion gap management is more demanding. In anterior referencing technique the flexion gap changes stepwise with the size of the femoral component, posterior referencing technique may result in anterior overstuffing or notching.

The sagittal position (i.e. the flexion) of the femoral component influences the flexion gap. It therefore could serve as tool to smoothly manage the flexion gap. This approach could be adopted in navigation workflow to improve gap management. The aim of the present study was therefore to calculate the effect of femoral component flexion on flexion gap for a prosthesis that is frequently implanted with navigation support.

Methods: The implant geometry of all available sizes of the e.motion total knee endoprosthesis (Aesculap) was digitally recorded. Based on this data a virtual implantation of the femoral component with a sagittal alignment between 0° and 5° of flexion was simulated. The resulting flexion gaps were calculated depending on the component alignment. The relationships between component alignment (in degrees) and flexion gap (in mm) were documented for every femoral component size.

Results: The narrowing of the flexion gap with increasing flexion was more or less linear in the range investigated and was dependent on the implant size. A narrowing of the flexion gap by 1 mm resulted in 2° (1.9° - 2.3°) flexion in the e.motion prosthesis.

Conclusions: A flexed positioning of the femoral component leads to a reduction of the flexion gap. This may serve as a tool to fine tune the flexion gap with navigation support.