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Abstract for WCB 2014 Submission – Poster

400 words (400 word limit)

The Effect of Femoral Rotation During Total Knee Arthroplasty on Patellofemoral Contact Characteristics

Patellofemoral joint (PFJ) complications are a common cause of dissatisfaction leading to revision total knee arthroplasty (TKA) due to wear and/or pain. It is thought that increased contact pressures and forces within the PFJ contribute to increased incidences of pain and wear of the patella button. Previous work suggests that this may be associated with femoral component rotation and hence this should be controlled tightly during surgery; but the available data are limited. This study aimed to assess the influence of femoral component rotation on the quadriceps forces, and the contact areas and compressive forces within the PFJ using an *in vitro*, non-cadaveric, TKA model.

Static and dynamic tests were carried out using a six degrees of freedom vertical knee simulator designed to replicate motion of an average UK woman. The movement at the knee is driven by actuation of the quadriceps model. The hamstrings are modelled physiologically by two cables each with a constant tension of 50N. Scorpio PS size 7 (Stryker, NJ) components were implanted in composite bones by an orthopaedic surgeon and primary ligaments were modelled using synthetic cords.

The required quadriceps force to achieve extension during a squat and the associated patella compressive forces were assessed using single axis load cells. The PFJ centre of pressure (COP) was measured using a pressure array (Novel, Munich) and the contact areas assessed using pressure film (FujiFilm). Three femoral positions were assessed (neutral, 5° internal and 5° external rotation) each with a 5 mm medialised patella dome and a centrally placed asymmetric patella button. Six repeats were carried out.

Irrespective of patella button type, femoral external rotation caused an increase of up to 10% in the required quadriceps force and compressive PFJ forces, likely due to the alteration of the Q angle caused by the component rotation. Internal rotation caused corresponding reductions. These trends are only significant in mid-flexion and are masked by increased loading. The patella button geometry also appeared to influence the degree to which femoral rotation affected the PFJ. Fewer differences were demonstrated with the medialised dome, which was associated with increasing lateral COP measurements post-TKA with external rotation. In contrast, the asymmetric dome demonstrated medial COP shifts with external rotation.

In conclusion, PFJ forces and pressures are influenced by a complex combination of prosthesis geometry and component positioning. As little as 5° of femoral rotation may have an implant specific, detrimental effect on the PFJ.