Experimental Setup and Kinematic Input Conditions Influence the Wear of Total Knee Replacements

Introduction

Wear performance of total knee replacements (TKR) can be determined pre-clinically through experimental [1] and computational wear simulation [2].

In experimental wear simulation our philosophy has been to set the centre of rotation of femoral components on their distal radius in order to facilitate femoral rollback [1].

Aim

The aim of this study was to investigate the influence of femoral setup (the position of the centre of rotation) and kinematic inputs (the amplitude and polarity of anterior-posterior displacement) on wear.

Materials

Sigma CR fixed bearing TKRs (DePuy Synthes, Leeds, UK) with curved moderately cross-linked polyethylene inserts (XLK) (n=6)

Results

The reversal of the AP displacement produced a significantly lower wearing configuration under high kinematic conditions on the ISO CoR (p<0.05).

On the distal radius the wear under high kinematic conditions was significantly higher than under intermediate conditions (p<0.05). However, for the TKRs on the ISO CoR, the trend was reversed.

Good agreement was found between our computational and experimental models.

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