EFFECT OF STEM DESIGN AND METHODS OF FIXATION ON STEM TIP PAIN IN REVISION TOTAL KNEE ARTHROPLASTY

+Oh Soo Kwon, *Dae Kyung Bae, *Yoon Hyuk Kim
+The Catholic University of Korea
oskn@catholic.ac.kr

Introduction
The use of stem provides both consistent component alignment and immediate stable fixation and protects grafted bone by reducing stress on metaphyseal area in revision total knee arthroplasty. One of major concern with use of stems involves stem tip pain in cementless diaphyseal engaging stem. The purpose of this study is to evaluate the effect of stem design and method of fixation on stem tip pain in revision total knee arthroplasty by finite element analysis.

Methods
3D finite element model was reconstructed from CT scan images of 26 year old male and the CAD model of revision total knee arthroplasty was developed using commercial software (CATIA, Dassault system, USA, version 8.20). The tibia component models were assembled based on conventional surgical procedure. Design change of the stem such as the length, diameter and slot was performed and method of fixation including press fit and coefficient of friction was considered. Contact pressure and von-Mises stress around the stem and the micromotion at the interface were evaluated for 2000N external load by finite element analysis to investigate the effect of stem design and methods of fixation on stem tip pain.

Results
The longer length and larger diameter press fit stem significantly increase the contact pressure & stress at the end of stem. The distal slot reduces the contact pressure & stress at the end of stem. Less displacement between tibial component and bone was noted in the increased coefficient of friction.

Discussion
It would be better to avoid using press fit stem with extended length and larger diameter with in revision total knee arthroplasty. More flexibility of stem tip would be favorable because of less concentration of stress. Stem fixation with higher coefficient of friction would be recommended for less displacement of tibial component. Stem with shorter length enough to engage proximal diaphysis, closer diameter of proximal canal and minimal press fit could be accepted to reduce end stem pain if patient's surgical anatomy such as bone loss & quality is tolerable in revision total knee arthroplasty.

*Kyung Hee University

53rd Annual Meeting of the Orthopaedic Research Society
Poster No: 0777