

#1063 - Experimental Study / Posters

Finite Element Analysis About Effect Of Bone Quality On Micromotion In Total Hip Arthroplasty.

Orthopaedics / Pelvis, Hip & Femur / Joint Replacement - Primary

Daisuke Koga

Japanese Red Cross Saitama Hospital, Saitama, Japan

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Background

Several studies reported that the amount of micromotion between bone and implant plays a role in the success or failure of bone ingrowth in cementless total hip arthroplasty (THA). However, it has not been reported how femoral bone quality is effective to the amount of micromotion.

Objectives

In the present study, we used finite element analysis to evaluate the micromotion between bone and implant in cases with different bone quality.

Study Design & Methods

The subjects were three joints of three cases (Dorr type A, B, and C) who underwent THA using a tapered wedge stem (Ovation Tribute®, Ortho Development).

CT images were taken before and after surgery, and a model was constructed in which the stem was inserted into the preoperative CT with the alignment obtained from the postoperative CT on the software (Mechanical Finder, Research Center of Computational Mechanics, Inc). As the loading condition, the condition of Bergmann et al., that was assumed climbing the stairs was selected. Micromotion between bone and implant was evaluated by separating it into three axes (vertical, antero-posterior and medio-lateral), and compared between cases.

Results

The micromotion was increased in the order of Dorr C > Dorr B > Dorr A. However, even in the Dorr C case, the micromotion was small enough to obtain bony fixation within the range of porous coating area. In all the cases, micromotion was small at the distal of the porous coating area, and was large at the proximal/distal ends of the stem. In the analysis separated into three axes, the micromotion in the antero-posterior direction is larger than that in two other axes.

Conclusions

From the results of current study, the better the bone quality, the smaller the postoperative micromotion tended to be. However, even in Dorr C cases, the micromotion was considered to be within an acceptable range, although there is a prerequisite that the preoperative planning was done well, and the proximal fixation was achieved according to the tapered wedge stem concept.