

Application of a Finite Element Method to Predict Fatigue Life of the Knee Mobile Bearing

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Abstract. Knee Arthroplasty is a surgical procedure where the patient's knee is replaced by prosthesis. By using the finite element analysis method, we can properly estimate the life span of the prosthesis and also the polymer mobile bearing between the prosthesis itself. Most of the prosthesis have a long lifespan but not for the polymer mobile bearing. Having only average of 2.5 years lifespan, it is a hassle for the patient to come back every 2.5 years to replace a new polymer especially for the elderly. This research is made to investigate and predict the fatigue life of the polymer mobile bearing via finite element method and thus to design a newly improved prosthesis model based on the commercially available. In this research, three different designs were made based on the currently available mobile-bearing design. Each of the design will undergoes different value of forces depending on three different of gait cycles which are walking, ascending from the stairs as well as rising from squatting. Based on the fatigue life prediction using finite element method, the proposed design (design 2) obtained the highest lifespan ranging from 1.0×10^6 to 1.2×10^6 cycle and it is increase almost 50% of the commercially available design life cycle (8×10^5 cycle). Thus, it is can be concluded that the finite element method can be used to predict life cycle of the mobile bearing successfully and can be used as a guided to propose an improved design of the prosthesis.