FINITE ELEMENT ANALYSIS OF PROXIMAL FEMUR USING CHARNLEY ELITE TYPE STEM

MUHAMAD ZAIDI BIN SALIM

(2005808117)

A thesis submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering (Hons.) Mechanical

Faculty of Mechanical Engineering

Universiti Teknologi MARA (UiTM)

MAY 2009

"I declared that this thesis is the result of my own work except the ideas and summaries which I have clarified their sources. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any degree."

Signed: .....

Date: .....

Muhamad Zaidi Bin Salim

UiTM No: 2005808117

ACKNOWLEDGEMENT

First of all, praise to Allah s.w.t for the rationale and good-health that has given to me, so I am capable to accomplish this project successfully. Thanks also to my beloved parents who give me a strong spirit to go further in any difficulties that I will face to.

Secondly, I would like to extend thanks to my respected lecturer, Encik Abdul Halim Bin Abdullah for their generosity in providing me a general concept of how to complete this project in most efficient manner. They willingness to help me were finding a way out of the difficulties whenever I encounter problems regarding this project. Indeed, providing us precious guideline in completing this project.

After undergoing numerous difficulties and hardship, ultimately I am able to accomplish and complete some of this project and compile it in this report. I would like to take this golden opportunity to express thanks to a few people who are involved in the accomplishment of this project, especially for Mr. Wan Mohd Osman Bin Wan Mansur who gave me a support, idea and critics to make sure I am always running this project parallel with what is he doing (their thesis).

Besides that, I would also wish to express my deepest and sincere gratitude to the librarians of Tun Abdul Razak Library in assisting me to find valuable information regarding to the topic of my project. Their cooperation collaboration had lessened much of my burden in collecting and finding information. Without their help, it is impossible for me to accomplish this project successfully and smoothly.

Abstract

A total hip replacement (THR) is also called a hip arthroplasty. This is a surgical procedure that re-forms the hip joint.The objective of this study is to analyze the stress distribution of the femur with cemented Charnley Hip Prosthesis THR and finally compared to clinical result of patient that used this type of stem. Finite element method is used to study the biomechanical behavior of the intact and THR femur. This study is focused on the static analysis on maximum loading during standing, walking and upstairs. Femur and contact femur was drafted and imported from CATIA software to ANSYS. The femur has modulus elasticity and Poisson's ratio of 17 GPa and 0.33 respectively. The Charnley Elite stem is used a bio compatibility material that is stainless steel alloy (316 L). This type of material has modulus elasticity and Poisson's ratio of 193 GPa and 0.27 respectively. As a result, stairs climbing given a highest stress distribution in any of three components either contact femur, stem and cement. This analysis then compared to the clinical outcome and we can see that there have close relations about them. Failure of THR like aseptic loosening, osteolysis, migration, cement mantle thickness and prosthesis fracture are much related to this analysis.

TABLE OF CONTENT