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Finite Element Analysis of Human Fractured Femur Bone Implantation with PMMA Thermoplastic Prosthetic Plate

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Abstract

Femur bone is the longest and stronger bone in the human body. This bone is contained a linear elastic, isotropic and homogeneous material of calcium phosphate. It needs to support maximum weight of the body in between hip joint and knee joint during static loading condition. Bone fracture is one of the common traumas. One method of rectifying the fractured bone is by joining the fractured bone by using prosthetic bone plates and screws. The objective of this study is to finite element analysis (FEA) of human fractured femur bone fixation with poly-methyl methacrylate thermoplastic (PMMA) prosthetic plate at mid-shaft position in static loading condition. Result analysis based on the thermoplastic biomaterial of which calculated mechanical strength is matched with the nearest value of femur material strengths. To prove that PMMA is best suitable material, compared the minimum value of an equivalent stress (von-misses stress), maximum total deformation, maximum and minimum principal stresses with respect of other biomaterials.

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Keywords: Femur bone, Prosthetic, Traumas, Biomaterials, Static structural, Stresses.

1. Introduction

An orthopedic implant is a medical technique developed to replace a missing joint or bone or to support a fractured bone. The medical implant is mainly fabricated using various metal alloys for strength covered by the plastic. Two types of fixation generally used- external fixation and internal fixation. In external fixation, metal pins that penetrated bone and protruded through the skin could be connected to an external clamp device, which would allow for

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