

ANALYSIS OF DRILLS USED IN BONE SURGERY

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ABSTRACT

The aim of this research is to find the life of the drill material used in bone surgery. In ancient days the doctors used to fix the bone fracture with the help of bamboo sticks, and a raw medicine from the forest due to the change of time, there are mechanical devices taking part in the human body as external bodies to the implementation also. In this work, three different materials are taken for testing and stress analysis of both static and dynamic for all the materials will be done to get the stress values for the life prediction inputs. Also, the optimization will be done to find out the best material. For evaluating the data obtained, wear analysis of different materials will be done and the life period will be compared with the fatigue life of the materials.

1. INTRODUCTION

Drill bit include very wide range of geometrically and functionally an operational surgical drill bit is the special group of medical instrument. Furthermore, because of a work in chemically active environment (body fluids, drugs) it is necessary to sterilize them after each use. The mentioned working conditions of the surgical instrument determine the selection of drill bit material which are Tungsten – Carbide, Titanium, Cobalt – Chromium and Titanium – chromium – vanadium.

1.1 Purpose

The aim of the work is determination of life period of a surgical drill – bone system in simulated conditions of drilling in a bone.

1.2 Design/methodology/approach

Drill is loaded with forces in the range $F=100200$ N and torque $T = 0.04$ Nm. Calculations were carried out for two kinds of metallic material of the drill. The dynamic load and Static load were considered in selection of drill bit materials.

1.3 Findings from the literature

The effect of numerical analysis determinate of strains and stresses in working part of the drill. Results of analysis indicate diverse values of strains and stresses distribution in working part of the drill depending on its

geometry. The maximum values of strains and stresses were obtained for the drill of point angle $2\kappa_1=120$ deg. For evaluating this wear analysis of different materials will be done and the life period will be compared with the fatigue life of the materials.

1.4 Research limitations/implications

In order to simulate phenomena in real system, a simplified model of surgical drill – femur system will be modelled for analysis. The simplifications concerned mostly geometry of a femur. The femur is represented by

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