Original Article

FEM Experimental Study in Surgical Treatment of Humeral Shaft Pseudarthrosis

Radu POPA[1] , Nicolae GORUN[2]

1 - *M.D. PhD „St. John" Clinical Emergency Hospital Bucharest*
2 - *Prof. M.D. Ph.D. University of Medicine and Pharmacy Craiova*

Abstract

Finite Element Method *was used to determine the state of stress of the humeral cortical, which is made when fixing a steel plate provided with six fixing holes and compression (installation) is provided by a Müller compactor. There were considered three cases of resection: straight parallel resection (humeral shaft angle of approximately 90°), oblique parallel resection (angle of approximately 75°) and resection in "opposite scale steps ", comparing the states and distribution of stress and strain. The study was conducted with the computer program ANSYS finite element V14.*

Keywords: *pseudarthrosis, humerus, surgical treatment, osteosynthesis, the finite element method.*

1. Introduction

In humeral shaft pseudarthrosis, the method of metal plate fixation of bone fragments plays an important role in the recovery and healing of bone tissue. This is because during installation, it can cause a local tension too high or too low, tension that require bone structure (living tissue) to respond to these requests by increasing or decreasing bone density. Another important factor is that the metal plate change tension "path", so around the cortical plate tensions are lower, leading to bone resorption. By mathematical simulation (FEM), the material properties of cortical and cancellous bone being determined by bone density, we are able to calculate the risk of fractures. Currently there are known bone recovery mechanism and the factors that contribute to faster healing. There have been studies on mathematical models that highlight the link between stress and bone density values, but we do not know exactly the limit values.