IX International Conference on Computational Bioengineering
ICCB 2022
P. R. Fernandes and J. Folgado (Editors)

Abstract ID 44

STABILITY OF TWO INTERNAL FIXATION IMPLANTS IN THE TREATMENT OF FEMUR FRACTURES: EXPERIMENTAL AND FINITE ELEMENT ANALYSIS

V. Maranha[1], M. A. Neto[2], L. M. Roseiro[3], M. Paulino[1], A. M. Amaro[1]
[1]University of Coimbra, CEMMPRE, Dep. of Mechanical Engineering, Coimbra, Portugal
[2]University of Coimbra, Dep. of Mechanical Engineering, Coimbra, Portugal
[3]Polytechnic of Coimbra, ISEC, Coimbra, Portugal
uc42059@uc.pt, augusta.neto@dem.uc.pt, lroseiro@isec.pt, maria.paulino@uc.pt, ana.amaro@dem.uc.pt

Keywords: Hip fractures; Finite element analysis; Experimental tests; DHS

Summary: The number of medical devices available to perform interventions for hip fractures is already relatively high. Some are appropriate for fractures at the femoral neck, while others seem to be specially developed to stabilize the intertrochanteric area. This study correlates the experimental and numerical results of a new Trochanteric Plate of Contention (TPC), which may improve the resistance to the cut-out failure of internal fixation devices, and the well-known Dynamic Hip Screw (DHS) system. Generally, it is well accepted that the DHS is the first option in the treatment of stable femur fractures, as well as it is considered the implant that any new design should be compared with. Hence, two Sawbones® synthetic femurs, produced using the fourth generation of composite bones, were fractured and, posteriorly, fixed with the two fixation implants, i.e., TPC and DHS. The experimental study compares the strains, stresses, and displacements on these implants under compression loads after surgical stabilization of a neck fracture. Still, numerical simulations of the experimental setups were also carried out. Electrical and optical sensors assured the data acquisitions. The experimental results showed that strain values are higher in the DHS than in the TPC device, particularly in the neighborhood of the cephalic screw, while numerical results show that the biomechanical behavior of TPC is promising.