

Title

Analysis of the mechanical performance of the Iliosacral Internal Fixation System applied in unstable lesions of the posterior pelvic ring using finite elements

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Introduction

The pelvic ring is one of the most stressed regions of the musculoskeletal system, because it transfers the load from the trunk to the lower extremities, mainly through its posterior component. The present study analyzes how the Iliosacral Internal Fixation System (SIFII), applied in unstable lesions of the posterior pelvic ring, performs mechanically, using finite element analysis to determine the usefulness of the device and its tolerance to the mechanical loads of the axial skeleton.

Materials & Methods

To evaluate the biomechanical behavior of SIFII, a virtual simulation study was carried out using a finite element analysis (FEA). Carrying out a computer-aided design (CAD) of a pelvis with a sacrum fractured in Denis's zone 2 and SIFII. Resulting in the placement of the system as fixation to the injury. Finally, the performance of the applied system was analyzed, under operation in a maximum stress cycle.

Results

According to the simulations carried out, the stress concentrations are located in the fixing device. Because the Von Mises stress is less than the yield strength of the material with which it is made, once the load is removed from the device, it recovers its original dimensions, since the deformations and stresses generated are within the elastic behavior of the material.

Conclusions

The implant does not deform with physiological load, nor does it produce failure in the cortical bone since maximum efforts generate elastic deformation, it is feasible to continue researching the device for its possible application in patients with these injuries.

Level of evidence: Experimental study, level III.