

Evaluation of external fixation device stiffness for rotary osteotomy

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Abstract

© Research India Publications. The paper presented the results of strength and stiffness calculation in respect of external fixation device used in the concept of a three-plane spatial correction of proximal femur abnormal orientation taking into account the stage of the disease concerning the localization of degenerative dystrophic process and damage severity. A three-dimensional parametric model of the device was developed and its finite element discretization by four node tetrahedral finite element with a linear approximation and the four node hexagonal finite element with linear approximation. The problem of stress-strain state determination was solved of the structure in the linear formulation on the basis of the finite element method for different values of swivel bracket structure turn. Stress localization zones, the dangerous sections of threaded connections were determined. We obtained the values of maximum shear stress and the stress intensity for various states of construction. On the basis of these data the workloads were determined, the threaded connections of which made 15 Nm by stiffness. The safety margin of the structure by plasticity allows the loads up to 24 Nm. In order to increase the reliability and the hardness of external fixation device the attachment points of pins to rotary brackets were reinforced by locknuts.

Keywords

Biomechanics, External fixation device, Rotational osteotomy, Stiffness