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CALCULATING MODELS FOR EVALUATION OF STRESSED-STRAINED CONDITIONS OF BONE TISSUE UNDER TOTAL HIP REMPLACEMENT

In the field of applied biomechanics the development of calculating models for studying the stressed-strained state of the bone tissue in a total hip remplacement, which provides man's movement and withstands a load, is the basic challenge. Finite-element calculating models of the bone-implant system in fixing an acetabulum component by threading or press-fitting a cup prosthesis are developed. The finite-element method in the form of the displacements method is used to study the stressed-strained state of the system under consideration. The 3D four-node finite elements are employed to build a finite-element model, and it is agreed that contact surfaces of a corpus of the acetabulum component and a pelvic bone are linked and move jointly. The stressed-strained states of the two versions of fixation of the mounted acetabulum component – with threaded or press-fitted cups – are calculated. It is found that in both cases the most loaded region is the one of the bone tissue contacting with an implant at a depth of 0-5 mm. The bottom of the acetabulum is characterized by maximum displacements. The values of maximum stresses and displacements increase as the thickness of the bone tissue following the bottom of the acetabulum decreases.

Keywords: replacement, implant, hip, bone tissue, stressed-strained conditions.

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