NUMERICAL MODEL OF A TIBIA WITH EXPOSED FRACTURE AND STABILIZATION SYSTEMS

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Abstract. The procedure for treating exposed mediadiaphyseal fractures comminuted in tibias usually consists of the use of external tutors linked by surgically placed nails with the aim of reaching the septic conditions of the trauma and then reposition and immobilizes the separated parts of the bone. Medical experiences show that the joint placement of the endomedullary nail with the external tutor improves the efficiency of the treatment, reducing the time of regeneration of soft parts (muscles, skin, etc.) and removal of the external structure, minimizing the patient discomfort. In this work, the increase in stiffness provided by the endomedullary nail is quantified numerically to decrease the relative movements between the two parts of the fractured bone. The three-dimensional modeling of an irregular body (bone) was analyzed in detail. The relative displacements between the bone and the nail, the proportions of stresses transmitted by the nail and the external tutor, and the connections between the bar elements and the solid elements were also investigated. Important increases in stiffness of the system and reduction of relative movements are obtained, for different variants of position of the fixations, straight and oblique fracture, and for various densities of bone, which allow validating the practical application.