

STRESS-DEFORMATION ANALYSIS OF ELBOW ARTICULATION

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In case of a traumatological contusion of the elbow joint the bearing surfaces of the proximal end of the radius are damaged or broken off, resulting in their surgical removal. This operation does not make the elbow connection non-functional; however, it results in shortening the antebrachial bones, causing unpleasant pain in the patient's wrist. The medical team of the Traumatological Hospital in Brno has asked us to come up with a partial radio-humeral alloplasty, eliminating such adverse effects.

Key words: *elbow joint, FEM, radial head replacement, partial radio-humeral alloplasty, contact stress*

1. Introduction

This contribution speaks about the progress of forming a geometric elbow model, generating the FEM network in the created volumes; stress-deformation analysis of the Final Element Model (contact task) and suggests a possible geometric model of partial alloplasty of the radius's proximal part.

2. Material features

The bone tissue consists of bone cells of long cell bodies with numerous protrusions in the basic substance channels. The basic substance comprises an organic part (ossein) and an inorganic one in variable proportions. As one gets older, the inorganic part grows and the bone becomes harder but more brittle and more connective. On the contrary, ossein secures elasticity and flexibility in young bones.

Bones involve two types of bone tissue; their percentage proportion differs in bones of various types. *Compact* bone tissue (substantia compacta) – is found especially in long bone diaphyses. Its growth activity and regeneration capacity are enormous. *Trabecular* bone tissue (substantia spongiosa) – is present above all in long bone epiphyses. It has a special structure, called bone architectonics, owing to their load in some bones.

The bone can be described as solid, relatively hard, mineralized connective tissue of yellow and white colour, having supportive and protective function. Experimental measuring of mechanical properties and features of the bone tissue results in values within a wide interval.

The interval width is caused by many factors affecting the measurement. These components involve factors that depend on the donor's physiological condition, such as age, sex

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