

Abstract

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Title of Thesis: Viscoelasticity of bones – the methodology of measurement

The aim of the thesis was to verify the methodology of measuring the viscoelastic parameters of human bones using an apparatus enabling the measurement of dynamic characteristics. The method is based on measurement of deformation response of samples to short or rectangular impulse of force. The samples were obtained from femoral head. The methodology is therefore based on measuring of creep curves and impulse characteristics. Resulting damped oscillations were analysed.

The transient and impulse characteristics in bending stress and twisting stress were obtained. Based on these characteristics, viscoelastic parameters of samples were determined (Young modulus, shear modulus and viscosity). The Poisson's number, indicating the ratio of transverse contraction to longitudinal extension of the material during deformation, was calculated using the values of Young's modulus and shear modulus.

The measured values of the Young's modulus in bending stress vary in the range from 62MPa to 670MPa. The values of the shear stress modulus range from 39MPa to 330MPa and the values of the viscous coefficient in twisting stress range from 87kPa.s to 279kPa.s.

In conclusion, the method was found as applicable and the found values proved to be useful as a rough overview. As the aim of this thesis was to verify the method, the behaviour analysis of the samples was not concerned.