

Abstract (english)

Hyaline cartilages are designed to enable smooth life-long articular movement. They serve also substantial role in load bearing, being loaded especially in normal compression. Eventual deterioration of articular cartilage tissue therefore has crucial consequences for affected individual. Characterization of native articular cartilage and application of gained knowledge in reconstructive cartilage treatment is therefore desired. Mechanical characteristics are of prime importance.

Blunt impact testing method in pendulum setup was developed to characterize cartilage tissue under physiological values of dynamic compressive loading. Information on impact process was simultaneously read by piezoelectric accelerometer and laser doppler vibrometer. Acquired data were processed to form loading diagrams and to evaluate standard mechanical quantities. The method was found to be consistent, reliable and effective way of mechanical characterization.

Introduced technique was used for qualitative and quantitative description of native articular cartilage, correlation of its condition with mechanical properties, assessment of tissue engineered materials quality and approval of newly designed artificial materials suitability. Considering native cartilage status, dissipated energy was found to be the most sensitive mechanical marker of its degradation. In tissue engineered materials, different approaches were confirmed to improve their mechanical properties. Analogous experimental system was set for dynamic tensile testing. It was employed in comparative study of knee anterior cruciate ligament and grafts used for its transplantation.