MECHANICAL CHARACTERIZATION OF BIOLOGICAL SOFT TISSUES UNDER TENSILE LOADING - EXPERIMENTATION AND NUMERICAL ASPECT

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For the first time in Sri Lanka, *rectus femoris* muscle has been used to characterize the mechanical properties of human soft tissues. These properties can be used to synthesis artificial tissue for bio engineering applications; if these biological soft tissues are to be replaced with polymer based biomaterial. Initially, uniaxial tensile test was performed on cadaveric samples obtained from national hospitals with the relevant ethical clearances. The obtained stress vs. strain graphs elucidates hyperelastic behaviour within non damage domain with initial J shape portion. It was also noticed that mechanical properties are highly non homogeneous as stress vs strain curves are different at different locations on the same cadaver. Variation of the "Damage" variable was also calculated to understand the degradation tendency of these biological materials under uniaxial tensile loading. '*Snudden'* formula was used to obtain shear modulus of these cadaver samples through curve fitting technique. A numerical model was developed using commercially available FEA software 'ABAQUS'; Based on the best fit analysis for the obtained stress vs stretch ratio graphs; 'Polynomial Strain Energy Density Function with N=2" was used to simulate the muscle samples. This numerical model also includes damage parameter through the introduction of "Ductile Damage" of FEA and the parameters of the numerical model were all calibrated well with the experimental observation.

Keywords: Biological Soft Tissue, Uniaxial Tensile Test, Ductile Damage, Finite Element Analysis