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Sommario	<p>This Ph.D. thesis is aimed at analyzing the mechanical behaviour of the biological soft tissue to simulate different aspects of the cardiovascular diseases and the experimental validation of the theoretical models. The research plan includes two parallel activities: a) FE modelling and simulation; b) mechanical testing on biological samples. Two specific surgical operations have been considered: the balloon angioplasty and the replacement of chordae tendineae using ePTFE. The simulations regard the mechanical behaviour of the artery with pressure beyond the physiological range and the 3D reconstruction of the artery vessel by imaging techniques from histological sections. As far as the FE modelling a specific probabilistic code was used and the sensitivity of the main mechanical properties was evaluated to take into account the different mechanical properties of the tissue. An elasto-plastic constitutive model for the plaque was considered to include plastic deformation for the biological tissue. A comparative study between Ansys and Abaqus was also performed for analyzing the capabilities and the differences between those softwares. Mechanical tests were carried out on biological samples such as arteries and chordae tendineae. Pressure-diameter test were performed and the incompressibility assumption was tested experimentally. An optical extensometer was realised in Matlab to investigate the static</p>

properties of natural and synthetic chordae tendineae. A new configuration of suture was also investigated and tested. Two flow simulators have been set up to analyse the dynamic properties of cardiovascular artificial devices.

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