718.019 Biomedical Sensor Systems, Laboratory

Institute of Biomechanics

Laboratory work

Biomechanical investigation of the porcine thoracic aorta

OBJECTIVES

(i) Experimental investigation of the mechanical response of the porcine thoracic aortic wall

MATERIALS & METHODS

Specimens: Healthy porcine aortas were obtained from a local slaughterhouse.

Preparations: First, the thoracic aorta will be cut in the longitudinal axis with scissors to obtain a flat rectangular patch. Dogbone-shaped specimens with circumferential and axial orientations will be prepared using a punching tool. Pieces of sandpaper will be mounted at the ends of the prepared specimens with superadhesive gel to facilitate a defined clamping in the tensile testing machine and to prevent slippage during testing. Black markers will be glued transversely in parallel onto the middle part of the samples to act as gage markers for the axial deformation measurements by the videoextensometer.

Tests: Passive uniaxial mechanical response with bi-dimensional deformation recording (gage width and gage length) of aortic strip specimens will be studied in 37°C physiological saline solution under quasistatic loading conditions. In particular, the specimens will be subjected to a first Piola-Kirchhoff (1. PK) stress of 50 kPa. For this stress value, preconditioning will be achieved by executing five loading and unloading cycles at a constant crosshead speed of 5 mm/min to obtain repeatable stress-strain curves. Thereafter, the specimen will undergo one additional quasi-static cycle with continuous recording of the tensile force, gage length and width for mechanical data evaluation. After all the loading-unloading cycles are completed, the load will be continuously increased until rupture occur to obtain the ultimate tensile stretch and stress of the tissues.

Additional measurements: Thicknesses of the investigated specimens will be determined by means of a videoextensometer.

EXPECTED RESULTS:

- Cauchy stress vs. stretch behavior

The lab report has to include a short introduction of the work, description of the methods, a results section and a short discussion of the results.