The perivascular adipose tissue may significantly change the mechanical state of the abdominal aorta. To this end, uniaxial tensile tests with perivascular fat tissue were carried out. In the subsequent regression analysis, stress-strain data were fitted by the polynomial strain energy density. A constitutive model of adipose tissue was used in the analytical simulation of the inflation-extension behavior of the human abdominal aorta. The computational model was based on the theory of the bi-layered thick-walled tube. In addition to the effect of perivascular tissue, the effect of axial prestretch was also studied. It was found that the presence of perivascular tissue reduces the distensibility of the aorta. Axial prestretch applied to aortas embedded in adipose tissue had an effect opposite to that of adipose tissue. Axially prestretched aortas exhibited higher distensibility than non-prestretched aortas. It was also shown that the perivascular envelope bears some portion of the pressure loading and thus reduces the mechanical stresses inside the wall of aorta. A similar effect was found for axial prestretch.

**Aim of the Study**

The work aims to confirm the significant influence of boundary conditions on the mechanical condition of the abdominal aorta. To confirm this hypothesis was considered:

- mechanical interaction of the abdominal aorta with human perivascular adipose tissue on its outer radius in order to obtain that it is necessary;
  - to identify mechanical properties by perform experiments with human perivascular adipose tissue,
  - to identify constitutive model of perivascular adipose tissue and then it is necessary to create analytical model by simulation of inflation-extension test of bilayer tube (abdominal aorta surrounded by perivascular adipose tissue).
- application of axial prestretch on ends of the abdominal aorta which is surrounding by perivascular adipose tissue in order to achieve investigation under realistic conditions.

**Uniaxial tensile tests with 15 PVAT samples**

![Distribution of in-wall stresses in bilayer tube](image)

**Constitutive model for abdominal aorta**

\[ W_A = W_{\text{anisotropic}} + W_{\text{anisotropic}} = \frac{\mu}{2} (1 - 3\nu) + \sum_{\kappa=3} \frac{k_1}{2k_2} \left( \kappa (\kappa - 1)^2 - 1 \right) \]

\[ K_i = k_i + (1 - 3\kappa) \lambda \]

\[ M_1 = (\cos(\beta), \sin(\beta))^T, M_2 = (\cos(-\beta), \sin(-\beta))^T \]

**Selected of author’s publications**


