Introduction
Living tissues continuously undergo growth, i.e. reorganization or renovation, and remodeling, i.e. a change in mass. Modeling both growth and remodeling (G&R) of the vascular tissue is aimed to provide the insight into the adaptation of the tissue, in the healthy and diseased state, and upon surgical intervention.

Material and methods
We model the tissue as two component constrained mixture, composed of anisotropic collagen fibres, and an isotropic matrix. The remodeling of the tissue is attributed to the degradation and the deposition of collagen. To keep track of properties of collagen fibres deposited at different times, we consider a collagen generation, a bundle of collagen fibres, deposited at time interval \((t, t+\Delta t)\).

Collagen degradation. Generations degrade with time, gradually decreasing their mass, until complete disappearance.

Collagen deposition. To compensate for the loss of collagen, a new collagen generation is created (Fig. 1).

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\begin{align*}
\text{t} & \quad \text{t} + \Delta t & \quad \text{t} + 2\Delta t \\
\end{align*}
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Fig. 1 Scheme of collagen degradation and deposition. At \(t=t_1\), a collagen generation, represented by the black lines is present in the tissue. At \(t=t_{n+1}\), the black generation has degraded partially, whereas a new (blue) generation is created. Finally, at \(t=t_{n+2}\), the blue generation starts degrading, the black one vanishes almost completely, and the red one is just deposited.

Directions of collagen fibres belonging to the new generation form a distribution, which depends on the local principal stretch directions of the tissue \(\lambda_1\) and \(\lambda_2\) (Fig. 2).

Each individual deposited collagen fibre is supposed to attach to the tissue with a constant prestretch \(\lambda_0\), which is the collagen stretch at the homeostatic state. The unstretched length of collagen fibres is governed by remodeling history, and may, therefore, differ over the generations (Fig. 3).

Results
The model was tested by determining a homeostatic state of cylindrical artery. At this state collagen stretch equals \(\lambda_0\) at each fibre direction, yielding no extra collagen production, and, consequently, no growth. Distribution of fibre directions is the same for all generations, changing in radial direction only. The results shown in Fig. 4 suggest that collagen fibres at the outer surface are more axially oriented and less uniform than the fibres at the inner surface, which is in agreement with histology.

Future work
Presented model of arterial G&R will be applied to cerebral arteries in order to predict aneurysm development.