At physiological load $F_{phys}$, Fig. 2, collagen is stretched to a preferred stretch $\lambda = \lambda_p$. Aneurysm growth is initiated by elastin degradation, leading to overstretching of collagen. In response, collagen remodels towards $\lambda > \lambda_p$, either by serial (rate $\alpha$) or by parallel (rate $\beta$) addition of collagen.

**Results**

Elastin stiffness was decreased regionally to 50% at $t=1$, Fig.3, causing an initial increase of collagen stretch, Fig.4. Subsequent remodeling causes an increase in collagen stretch until $t=45$ (Fig. 4), accompanied by increasing aneurysm size, Fig. 3 and Fig. 5. After a decrease of collagen stretch, the computation fails at $t=67$.

**Introduction**

An aneurysm is a pathological widening of a blood vessel, which may grow with time. Cerebral aneurysms pose a serious problem because of the possibility of rupture. They can be visualized by the modern X-ray medical equipment, Fig. 1, but the question of their likelihood of rupture is open. Physicians make their decision about treatment based on the aneurysm size. However, small aneurysms can rupture, while large ones may remain stable for years. The goal of this study is to get insight into aneurysm development and rupture risk.

**Material and methods**

The arterial wall is represented by a thick-walled cylinder of fibre-reinforced material, consisting of two symmetrical helical structures of collagen fibres embedded in isotropic elastin.

**Conclusions**

The current model can describe the aneurysm growth by remodeling of the tissue during initial stages of aneurysm development. The computational instability at later stages is attributed to material instability of the tissue, related to the discrete uniaxial representation of collagen fibres.

**Future work**

The material instability will be prevented by including a distribution of collagen fibre directions. In addition, the model will be made more realistic by taking into account fiber reorientation and volumetric growth of the tissue. Model validation will include comparison of predicted growth rates and aneurysm shapes to those obtained from X-ray images. Ultimately, the physician will be supported by model prediction on growth in the decision on aneurysm treatment.