A computational model to describe the collagen orientation in statically cultured engineered tissues

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stress–fibers $\eta$ is modeled by a first–order kinematic scheme and assumed equal to the collagen content.

**Results**

A 3D finite element model (FEM) is derived. The model is validated using experimental results where TE strips are developed under uniaxial static conditioning [3] (Fig. 1). The model is then utilized to predict experimental results in TE small diameter vessels developed under the same conditions (Fig. 2). The TE vessels are allowed to compact in length to a final value of $\lambda_z=0.88$.

The numerical framework predicts a compaction of 56% of the initial width comparable to the 60% obtained experimentally [3]. The volume fraction $J$ is lower near the lumen and increases through the outer side of the vessel. The model also outcomes a collagen orientation comparable to experimental results: circumferential near the lumen and longitudinal along the outer wall [3].

**Discussion**

The model successfully predicts the collagen fiber orientation obtained in TE small diameter vessels developed under static loading conditions. Thus cellular traction is an important component in collagen remodeling. Therefore, the model may be a valuable factor in the improvement of loading protocols for TE.