**Three-Dimensional Model for Smooth Muscle Contraction: Urinary Bladder Wall Application**

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The urinary bladder wall is a soft tissue that constitute the bladder organ and control all its functions. Such a functionality is achieved due to a specific hierarchical layered structure which featured non-linear hyperelastic mechanical response with hysteresis and softening effects as well as regional variability across the organ. Therefore, a detailed constitutive model of urinary bladder wall that account for its singularities will provide a useful tool for medicine and biomedical engineering applications. To work in that direction, a recently developed model for smooth muscle contraction of the urinary bladder [Seydewitz et al. 2017] is improved with new region-specific mechanical and histological data. The model features the urinary bladder wall in two layers: One layer with passive mechanical properties, the tunica mucosa, and another layer with passive and active response, the tunica muscularis. For the passive response, location-specific biaxial tests of the intact bladder wall as well as the mucosa and muscularis layers independently were use to identify the parameters. At the same positions, the smooth muscle orientation was histologically measured catching the in-plane and transmural fibre distribution. For the active response, layer-specific orientation-dependent uniaxial test were use. As a result, the temporal progression of four variables namely, electrical potential, calcium concentration, degree of activation and von Mises stress are simulated in a three-dimensional urinary bladder model.

**References**

*R. Seydewitz, R. Menzel, T. Siebert, M. Böl, Three-dimensional mechano-electrochemical model for smooth muscle contraction of the urinary bladder, Journal of the Mechanical Behavior of Biomedical Materials, 75, 128-146, 2017.*