Abstract Submitted
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A musculo-mechanical model of esophageal transport based on an immersed boundary-finite element approach[1] WENJUN KOU, Theoretical and Applied Mechanics Program, Northwestern University, BOYCE E. GRIFFITH, Departments of Mathematics and Biomedical Engineering, University of North Carolina at Chapel Hill, JOHN E. PANDOLFINO, PETER J. KAHRILAS, Feinberg School of Medicine, Northwestern University, NEELESH A. PATANKAR, Department of Mechanical Engineering, Northwestern University — This work extends a fiber-based immersed boundary (IB) model of esophageal transport by incorporating a continuum model of the deformable esophageal wall. The continuum-based esophagus model adopts finite element approach that is capable of describing more complex and realistic material properties and geometries. The leakage from mismatch between Lagrangian and Eulerian meshes resulting from large deformations of the esophageal wall is avoided by careful choice of interaction points. The esophagus model, which is described as a multi-layered, fiber-reinforced nonlinear elastic material, is coupled to bolus and muscle-activation models using the IB approach to form the esophageal transport model. Cases of esophageal transport with different esophagus models are studied. Results on the transport characteristics, including pressure field and esophageal wall kinematics and stress, are analyzed and compared.

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