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Characterization of Flow Mediated Dilation via a Physics-Based Model BCHARA SIDNAWI, Villanova University, ZHEN CHEN, CHANDRA SEHGAL, University of Pennsylvania, SRIHDAR SANTHANAM, QIANHONG WU, Villanova University, CELLULAR BIOMECHANICS AND SPORTS SCIENCE LABORATORY TEAM, DEPARTMENT OF RADIOLOGY AT THE UNIVERSITY OF PENNSYLVANIA TEAM — In this work, a preliminary physics-based model describing the transient behavior of the brachial artery during the Flow Mediated Dilation (FMD) test, is developed. Experimental diameter vs. time data were collected, via in-vivo ultrasound imaging. The model, which also accounts for mechano-transduction, was able to capture a key feature of the experimentally observed responses which a conventional viscoelastic model fails to explain. Characteristic dimensionless groups quantifying the physical state of the artery emerged from the model. The values of these dimensionless quantities, that predicted a response that best matched the experimental counterpart corresponding to a specific artery, were considered the values characterizing it. The meaning of these parameters and how they can be related to the cardiovascular health are discussed and explained. The transient physics manifested in the two-way Fluid-Structure Interaction (FSI) driving the FMD process, present an interesting opportunity to explore the nature of living materials making up the arterial walls, which would in turn lead to a better understanding and therefore detection of the onset of some forms of Cardiovascular Disease (CVD).

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