On the Normal Force Mechanotransduction of Human Umbilical Vein Endothelial Cells\footnote{This research was supported by the National Science Foundation under Award 1511096.} AMIR VAHABIKASHI, QIUYUN WANG, JAMES WILSON, QIANHONG WU, Villanova University, VUCBMSS TEAM — In this paper, we report a cellular biomechanics study to examine the normal force mechanotransduction of Human Umbilical Vein Endothelial Cells (HUVECs) with their implications on hypertension. Endothelial cells sense mechanical forces and adjust their structure and function accordingly. The mechanotransduction of normal forces plays a vital role in hypertension due to the higher pressure buildup inside blood vessels. Herein, HUVECs were cultured to full confluency and then exposed to different mechanical loadings using a novel microfluidic flow chamber. One various pressure levels while keeps the shear stress constant inside the flow chamber. Three groups of cells were examined, the control group (neither shear nor normal stresses), the normal pressure group (10 dyne/cm$^2$ of shear stress and 95 mmHg of pressure), and the hypertensive group (10 dyne/cm$^2$ of shear stress and 142 mmHg of pressure). Cellular response characterized by RT-PCR method indicates that, COX-2 expressed under normal pressure but not high pressure; Mn-SOD expressed under both normal and high pressure while this response was stronger for normal pressure; FOS and e-NOS did not respond under any condition. The differential behavior of COX-2 and Mn-SOD in response to changes in pressure, is instrumental for better understanding the pathogenesis of hypertensive cardiovascular diseases.

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