Biomechanics in Cardiovascular Disease: Imaging-based Numerical Modeling

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Abstract: As the need for understanding the physics behind human physiology increases, a closer involvement of physicists and engineers with the medical community is required. Through this collaboration, not only medical treatments may be improved, but also diagnostic techniques and preventive strategies can be developed. During the talk, I will focus my collaborative work with radiologists and vascular surgeons to analyze the role of hemodynamic forces on the progression of atherosclerosis in the carotid artery. Rupture of carotid atherosclerotic lesions is one of the leading causes of stroke. In the last decade, much research has been dedicated to finding "vulnerable" plaques—plaques at higher risk for causing stroke than others. The degree of luminal narrowing, or stenosis, has been used as the criteria to determine vulnerable plaques. However, stenosis alone is still a relatively poor predictor for stroke. Studies have shown that plaques with certain constituents (such as a thin fibrous cap with lipid-rich necrotic core) are more prone to rupture, thus causing stroke. However, many questions remain about the complex mechanisms behind plaque formation and vulnerable plaques. We are currently investigating the role of mechanical forces on plaque vulnerability. Future research will need to incorporate statistical modeling in order to elucidate the complex interplay between plaque mechanics, plaque morphology and composition, and demographical data.

Bio: *Gador Canton* joined the UW Mechanical Engineering Department as a Research Assistant Professor in 2012. Dr. Canton graduated from the Mechanical and Aerospace Engineering Department at UC San Diego in 2004. After graduation, she lectured in the University Carlos III in Madrid, Spain, while continuing her research at UCSD. She came to the University of Washington in 2006, when she joined the Vascular Imaging Laboratory, associated to the UW Radiology Department, for postdoctoral training in magnetic resonance imaging physics and analysis.