

# An Integrative Approach to Understand Vascular Adaptation in Health and Disease

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## **Abstract:**

Blood vessels are subjected to an altered hemodynamic environment in many surgeries including coronary artery bypass and single ventricle palliation surgeries. Not much is known about the ensuing vascular remodeling, including adaptation versus maladaptation. Models (both computational and animal) hold great promise in probing, understanding and gaining insights into these (mal)adaptations at multiple biological scales. In this talk, with vein graft failure in coronary bypass graft surgery as an example, I will present how computational models have enabled better insights into vascular adaptation and aided translation of novel solutions to prevent graft failure. I will elaborate on the mechanics-based, biology-informed computational models developed to understand (mal)adaptive processes at tissue and cellular scales. I will also discuss utility of this integrative framework in other clinical applications such as virtual surgical planning and arterio-venous fistula failures.

## **Biography:**

Abhay Ramachandra is a mechanical engineer by training and received his BTech in Mechanical Engineering from the National Institute of Technology Karnataka, Surathkal, in India. He received his Masters in Mechanical Engineering from the Carnegie Mellon University, PA and a PhD in Engineering Sciences from the Department of Mechanical and Aerospace Engineering at the University of California San Diego, CA. His thesis was on computational modeling of vein graft failure in coronary artery bypass graft surgery. Currently, he is a postdoctoral associate in the Department of Biomedical Engineering at the Yale University, CT. Abhay's research interest is in vascular mechanics and adaptation. He is trained in both computational and experimental biomechanics and has applied his training to multiple problems in vascular adaptation including vein graft failure in coronary artery bypass graft surgery, tissue engineered vascular grafts, systemic hypertension, aortic dissection and various pulmonary pathologies. Abhay is also passionate about translational research.

**\*This seminar counts towards the ME 600 seminar requirement  
for Mechanical Engineering graduate students.**

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