The role of microvesicles in cardiovascular calcification

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Friday, April 10th, 2015
LECTURE: 9:00 AM - 10:00 AM
ENGINEERING CENTER
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Abstract: The global impact of the spectrum calcific cardiovascular diseases is serious but underappreciated health problem. Cardiovascular calcification is an independent risk factor for cardiovascular morbidity and mortality. Ectopic mineralization mainly affects the aorta, coronary arteries, peripheral arteries, and aortic valves, with fully-formed bone observed in atherosclerotic plaques and stenotic aortic valves. This disease of dysregulated metabolism is no longer viewed as a passive degenerative disorder, but instead as an active process triggered by pro-inflammatory cues. Hypercholesterolemia, metabolic syndrome, end-stage renal disease, diabetes mellitus and increased age accelerate cardiovascular calcification. Traditional imaging modalities such as computed tomography, although perfectly adept at identifying advanced calcification, cannot detect the early stages of this disorder and offer limited insight into the mechanisms of osteogenesis. Here we present optical molecular imaging as a promising tool that simultaneously detects pathobiological processes associated with inflammation and calcification in vivo. Research into treatment of cardiovascular calcification is lacking, as shown by clinical trials that have failed to demonstrate the reduction of calcific aortic stenosis. Hence the need to elucidate the pathways that contribute to cardiovascular calcification and to develop new therapeutic strategies to prevent or reverse calcification has driven our investigations. This presentation will discuss studies that have used molecular imaging methods to advance knowledge of cardiovascular calcification, focusing in particular on the inflammation-dependent mechanisms of arterial and aortic valve calcification via the release of calcifying extracellular vesicles.

Biography: Dr. Elena Aikawa is an Associate Professor of Medicine at Harvard Medical School and a Principle Investigator at the Center for Excellence in Vascular Biology, and Director of the Vascular Biology Program at the Center for Interdisciplinary Sciences at Brigham and Women’s Hospital, Boston, MA, USA. Dr. Aikawa has played a pioneering role in the discovery of inflammation-dependent mechanisms of calcification, and in advocacy for the early imaging and treatment of calcific aortic valve disease. Her current research aim is to develop new therapies to cure calcific aortic valve stenosis, a disease that currently has no treatment except surgical valve replacement. She is currently the PI on multiple, actively funded NIH R01 grants. Dr. Aikawa is a member of the National Heart, Lung, and Blood Institute (NHLBI) Working Group on Calcific Aortic Valve Stenosis and the Alliance of Investigators on Calcific Aortic Valve Disease. She is an Editorial Board Member of Arteriosclerosis, Thrombosis and Vascular Biology, PLoS ONE, Journal of Extracellular Vesicles, and Circulation Research. Dr. Aikawa has delivered over 80 keynote lectures, invited talks and cardiovascular grand rounds, and authored more than 130 manuscripts on cardiovascular pathobiology. In addition to her strong interest in research, she also enjoys educating and mentoring young scientists. Throughout her career, she has trained a number of research fellows, medical and PhD students. Dr. Aikawa is also committed to advancing the careers of women in science and medicine. She cofounded the Brigham and Women’s Hospital Committee for Internationally Trained Women Faculty in 2004 and founded the annual Women in Science and Medicine Symposium at Brigham and Women’s Hospital in 2012. She is a member of Women’s Leadership Committee of Council on Atherosclerosis, Thrombosis, and Vascular Biology, American Heart Association.

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