Autophagy overview and its role in vascular biology

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Autophagy is defined as an evolutionarily conserved process of recycling, whereby intracellular macromolecules are broken down into their constituent parts within the lysosomes. The major functions of constitutive autophagy are removal of damaged or senescent organelles and maintenance of basal energy balance, while adaptive autophagy can mobilize intracellular nutrients to meet energy requirements in the event of nutrient deficiency. Therefore, autophagy is essentially a metabolic process that can control cellular energy balance. Growing evidence demonstrates that basal autophagy is a crucial in vivo process maintaining proper vascular function. Recent studies suggested a growing suspicion that autophagic dysregulation might be a common pathway through which vascular aging and associated pathologies develop. Furthermore, autophagy is stimulated by various stress-related stimuli in the arterial wall to protect endothelial cells and smooth muscle cells against cell death and the initiation of vascular disease, in particular atherosclerosis. Autophagic flux plays an atheroprotective role during early atherosclerosis but becomes dysfunctional in advanced atherosclerotic plaques. In addition, emerging evidence links autophagy to a wide array of vascular processes ranging from angiogenesis to calcification of the vessel wall. Here, I will review the overall concept of autophagy and present the progress in understanding how autophagy can contribute to vascular biology and the promising strategies to modulate this process for therapeutic benefit.