Vascular dysfunction in hypertensive disorders

Guest Editor: Gustavo H. Oliveira-Paula

A fully functional vascular system is essential to maintain normal tissue function. This system is intrinsically regulated by endothelial cells, smooth muscle cells, and extracellular matrix, which are able to respond to physiological and pathophysiological stimuli and to rearrange their architecture to maintain adequate blood flow according to the metabolic demand of the tissue. Rapid calibration of lumen diameter can occur through vasomotor regulation controlled by the sympathetic nervous system and vasoactive mediators, while the long-term structural adaptation occurs through a process called “vascular remodeling.” Vascular remodeling is the capacity of the vessel wall to reorganize its cellular and extracellular components in response to a chronic stimulus. In this respect, a growing number of evidence indicates that abnormal vascular remodeling contributes to cardiovascular diseases, including hypertension. The vascular endothelium, owing to its location lining the lumen of blood vessels, plays a critical role in vascular remodeling observed in hypertension, which is not surprising, given that endothelial dysfunction has been recognized as a hallmark of this disease. The endothelium produces a variety of substances that influence vascular tone and protect the vessel wall against inflammatory cell adhesion, thrombus formation, and vascular cell proliferation. The primary biologic mediators emanating from the endothelium include nitric oxide (NO) and the arachidonic acid metabolite prostacyclin (PGI2), which exert powerful vasodilatory, antiadhesive, and antiproliferative effects in the vessel wall. In addition, the endothelium produces several vasoconstrictor and proadhesion molecules such as endothelin-1, angiotensin II, and thromboxanes, which counteract the effects of NO and PGI2. In physiological conditions these opposing modulators from the endothelium are in equilibrium, and vascular homeostasis is maintained. However, in the presence of sustained pathophysiologic stimuli such as hypertension, the availability of protective mediators such as NO and PGI2 is reduced, leading to increased vascular tone and proliferation of the media smooth muscle cells, thereby contributing to hypertension and vascular remodeling. Therefore, endothelial dysfunction and vascular remodeling are two major, interconnected processes that result in the dysfunctional vascular system observed in hypertensive disorders. These processes are modulated by genetic predisposition and environmental factors such as excessive body weight, dietary sodium intake and xenobiotic exposure, and involve several complex mechanisms, including oxidative stress, inflammation, and disruption of signaling pathways critical for vascular homeostasis. Taking these factors and mechanisms into account, the aim of this thematic issue is to provide new insights into vascular dysfunction in hypertensive disorders and will include the following sub topics:

1) **NADPH oxidases in hypertension-induced vascular remodeling**
2) **Matrix metalloproteinases in hypertension-induced vascular remodeling**
3) **NLRP3 inflammasome in vascular dysfunction induced by hypertension**
4) **Toll-like receptors in vascular dysfunction induced by hypertension**
5) **Role of sphingolipids in vascular dysfunction induced by hypertension**
6) **Endothelial dysfunction in metal-induced hypertension**
7) **Nitrite and nitrate as a potential therapeutic strategy to treat hypertension-induced vascular remodeling**
8) **Genetic markers of endothelial dysfunction in hypertension**
9) **Novel cellular mechanisms underlying vascular dysfunction in hypertensive disorders of pregnancy**
10) **Genetic markers of endothelial dysfunction in hypertensive disorders of pregnancy**

Proposed date of submission of the articles: October 15th 2019.

List of potential contributors:

Rhian Touyz (University of Glasgow, UK)
Rita Tostes (University of Sao Paulo, Brazil)
Maria Carrillo-Sepulveda (New York Institute of Technology, USA)
Jose Eduardo Tanus-Santos (University of Sao Paulo, Brazil)
Annarita Di Lorenzo (Cornell University, USA)
Monica Paoliello (State University of Londrina, Brazil)
Ellen Kovner Silbergeld (Johns Hopkins University, USA)
Riccardo Lacchini (University of Sao Paulo, Brazil)
Marcelo Luizon (Federal University of Minas Gerais, Brazil)
Babbette LaMarca (University of Mississippi Medical Center, USA)
Lorena Amaral (University of Mississippi Medical Center, USA)