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Role of Endothelial Cells in Immunity and Vascular Dysfunction

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Commentary

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DESCRIPTION

Despite a lengthy period of intensive research, atherosclerosis remains a serious clinical problem. Atherosclerotic cardiovascular diseases are a major cause of hospitalizations, temporary and permanent disability, and mortality in many countries around the world. The economic and social burden associated with atherosclerosis is thought to be so significant, both globally and for individual patients, that it ranks as the leading medical problem of our time. It is important to note that atherosclerotic cardiovascular diseases are frequently diagnosed at clinically advanced stages, when therapeutic options are already limited and do not allow all patients to be cured. These and other findings add to our understanding of the clinical importance of delving deeper into the mechanisms. The transition to personalised therapy based on an understanding of the individual disease trajectory appears to be an important direction in future cardiology, which will improve long-term treatment efficacy. Atherosclerosis is more common in older people, especially those who have risk factors like overweight and obesity, lack of physical activity, smoking, and dyslipidemia [1-3], as well as a number of comorbid conditions like arterial hypertension, chronic obstructive pulmonary disease (COPD), and diabetes. Correction of risk factors is regarded as the most important therapeutic task, both at the prevention stage and as part of the patient treatment scheme. It allows for a slower progression of atherosclerosis and its clinical manifestation.

It is important to note that, despite the systemic nature of the major risk factors, the progression of atherosclerosis in the arterial bed is not diffuse, but rather specific to specific areas of the arteries with bends and branches. Such locations include coronary arteries, carotid artery bifurcations, and lower limb artery branches, where local hemodynamic factors act. Endothelial dysfunction promotes the adhesion of immune cells circulating in the bloodstream, which initiates further stages of atherosclerosis progression, according to a growing body of evidence. These and other findings have contributed to a better understanding of the role of endothelial cells in atherogenesis. Endothelial cells [4,5], which line all blood vessels in a monolayer, form the blood-tissue interface and regulate its permeability. Data obtained in recent years have significantly expanded our understanding of endothelial cell functions, allowing them to be considered a key participant in vascular biology. Many of these functions are interconnected and have complex regulatory pathways. Endothelial dysfunction, which is associated with decreased nitric oxide (NO) bioavailability, is thought to be a key link in the early history of atherogenesis.

Inflammation in the vascular wall, which is associated with an imbalance in the production of lipid mediators involved in the activation and resolution of inflammation, is also a critical step in determining the rate of progression of atherosclerosis. Furthermore, local changes in vascular hemodynamics, such as turbulent blood flow, may be related to atherosclerotic lesion localization. A growing body of evidence supports the idea that these pathogenesis chains are inextricably linked, but the keys to understanding many of these connections remain elusive to researchers and clinicians.The analysis of data obtained in experimental animal models has resulted in a better understanding of some of these functions, which has also further expanded concepts about the evolutionary roots of endothelial function and filled some gaps in the interpretation of the pathophysiological mechanisms of atherogenesis. Thus, the goal of this review is to discuss the role of evolutionarily determined molecular mechanisms in atherogenesis that underpin endothelial cell functions in innate immunity and participation in vascular hemodynamic regulation.

CONCLUSION

Endothelial cells form the inner lining of blood vessels and play an important role in the barrier's function between tissues and blood. Furthermore, the endothelium is phenotypically specialised for various tissue types. Endothelial cells in the brain and retina form specialised tight junctions that ensure the histo-hematic barrier against the penetration of circulating molecules and cells into these tissues. On the contrary, the endothelium in the liver and kidneys, which provide filtration functions, may be discontinuous, promoting infiltration and extravasation of circulating molecules and particles in the bloodstream.

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