

# Influence of Elevated Blood Pressure in Arterial Walls: Progression of Atherosclerosis

Claudia Antony\*

Department of Cardiac Surgery, University of Groningen, Groningen, Netherlands

## DESCRIPTION

Hypertension, often referred to as high blood pressure, is a common medical condition affecting millions worldwide. It is a significant risk factor for various cardiovascular diseases, including atherosclerosis, a condition characterized by the development of plaque in the arteries. Atherosclerosis progression is influenced by multiple factors, including hypertension and changes in arterial wall properties. Understanding the interaction between hypertension, arterial wall expansion, and their effects on transport properties is important in understanding the mechanisms driving atherosclerosis and developing effective preventive and therapeutic strategies.

### Hypertension and arterial wall expansion

Hypertension exerts excessive force on the arterial walls, leading to their expansion and remodeling. Chronic high blood pressure causes structural changes in the arteries, such as thickening of the arterial walls (arterial hypertrophy) and increased stiffness (arterial stiffness). These alterations disrupt the normal functioning of blood vessels and have profound implications for blood flow dynamics and transport properties within the arterial system.

### Hypertension and arterial wall changes

Hypertension imposes sustained pressure on arterial walls, inducing structural adaptations known as arterial wall changes. Upon, these changes defined as arterial hypertrophy and increased stiffness, reduces the normal vascular structure. Such alterations not only accommodate the mechanical integrity of blood vessels but also influence the transport properties governing blood flow dynamics and molecular exchange across the arterial wall.

### Implications for atherosclerosis development

Atherosclerosis emerges as a consequence of complex interaction

between hypertension, arterial wall changes, and difficulties in transport characteristics. The altered hemodynamic forces and disturbed flow patterns associated with hypertension promote the retention of circulating lipids and inflammatory cells within susceptible regions of the arterial wall. Concurrently, endothelial function and augmented oxidative stress contribute to the initiation and progression of atherosclerotic lesions.

**Impact on transport properties:** The transport properties of blood, including its flow dynamics and the movement of various substances across the arterial wall, are significantly influenced by hypertension and arterial wall expansion. Elevated blood pressure alters flow patterns, promoting turbulence and disturbed flow in regions of arterial curvature and branching. Such abnormalities can promote the retention of circulating lipids, inflammatory cells, and other atherogenic particles within the arterial wall, fostering the development of atherosclerotic plaques.

Furthermore, changes in arterial wall properties, such as increased stiffness and decreased compliance, affect the transmission of pulsatile pressure waves generated by the heartbeat. This altered pressure wave propagation can contribute to endothelial dysfunction, inflammation, and oxidative stress, which are all key contributors to atherosclerosis progression.

### Atherosclerosis progression

Atherosclerosis is a complex, multifactorial disease involving the accumulation of cholesterol, immune cells, and other substances within the arterial wall, leading to the formation of plaques. Hypertension and arterial wall expansion play pivotal roles in driving the initiation, progression, and complications of atherosclerosis.

Chronic hypertension promotes endothelial dysfunction, characterized by impaired vasodilation, increased permeability, and enhanced expression of adhesion molecules. These changes facilitate the adhesion and infiltration of monocytes and other

**Correspondence to:** Claudia Antony, Department of Cardiac Surgery, University of Groningen, Groningen, Netherlands, E-mail: antonyclaudia@yahoo.com

**Received:** 13-Feb-2024, Manuscript No. AOA-24-30882; **Editor assigned:** 16-Feb-2024, PreQC No. AOA-24-30882 (PQ); **Reviewed:** 01-Mar-2024, QC No. AOA-24-30882; **Revised:** 08-Mar-2024, Manuscript No. AOA-24-30882 (R); **Published:** 15-Mar-2024, DOI: 10.35841/2329-9495.24.12.439.

**Citation:** Antony C (2024) Influence of Elevated Blood Pressure in Arterial Walls: Progression of Atherosclerosis. Angiol Open Access. 12:439.

**Copyright:** © 2024 Antony C. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

immune cells into the arterial intima, initiating the inflammatory cascade central to atherosclerosis development.

Moreover, the altered flow patterns and increased shear stress associated with hypertension and arterial wall expansion contribute to the preferential deposition of lipids and inflammatory mediators in regions of disturbed flow, such as arterial bifurcations and curvatures. Upon, these lipid-rich areas undergo further cellular proliferation, matrix remodeling, and calcification, culminating in the formation of advanced atherosclerotic plaques.

## CONCLUSION

The impact of hypertension and arterial wall expansion on transport properties linked to the pathogenesis of atherosclerosis.

Understanding these mechanisms is essential for development of targeted therapeutic interventions aimed at preventing or mitigating the progression of atherosclerotic disease. Future research focusing on elucidating the molecular and biomechanical aspects of this interaction aims for the development of novel therapeutic strategies to combat cardiovascular diseases associated with hypertension and atherosclerosis.