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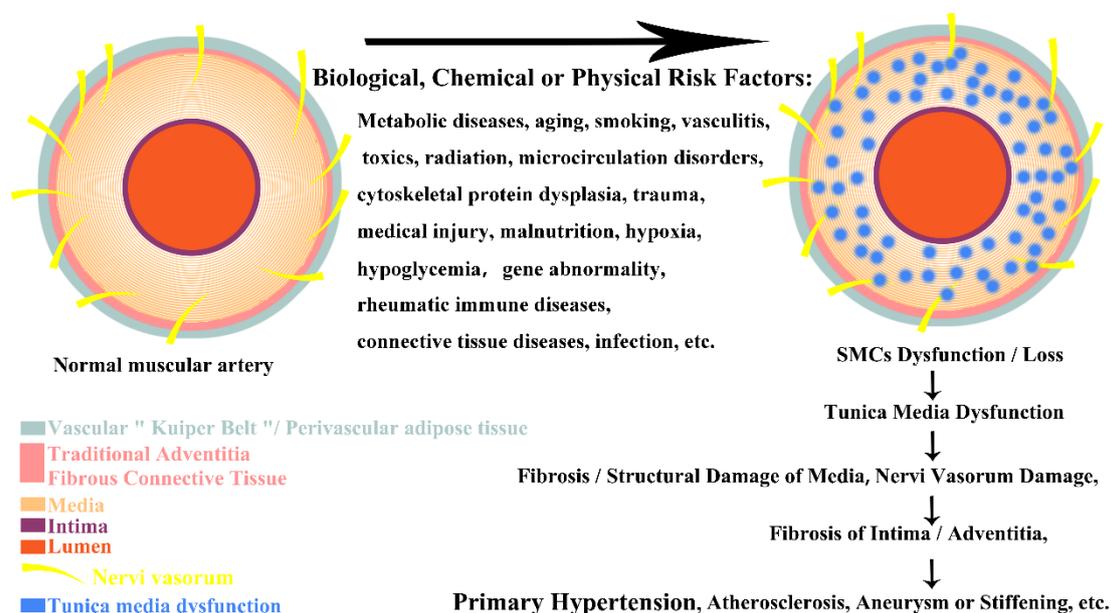
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# Tunica Media Dysfunction and Primary Hypertension

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## Tunica Media Dysfunction and Primary Hypertension

Figure 1. Tunica Media Dysfunction and Primary Hypertension

### Main text

Hypertension can significantly increase the risk of vascular diseases such as atherosclerosis, stiffening and aneurysms<sup>1-6</sup>. Traditionally, hypertension is divided into primary hypertension and secondary hypertension. Hypertension secondary to pheochromocytoma, renal artery stenosis, anemia, chronic kidney dysfunction, etc. is

classified as secondary hypertension. Except for secondary hypertension, others are classified as primary hypertension. By alleviating the secondary causes, secondary hypertension can be treated or even cured. Due to the unclear mechanism of primary hypertension, it is impossible to be completely cured till now. Even if there is renal denervation (RDN), its reliability is still controversial. Therefore, lifetime drugs treatment of primary hypertension is still the main clinical treatment now. Therefore, it is worthwhile to explore the mechanism of primary hypertension. This paper mainly discusses the pathogenesis of primary hypertension, hoping to provide a theoretical basis for the prevention, remission, or etiological treatment of primary hypertension. Secondary hypertension is hypertension with known inducement, which might be cured by alleviating the inducement. In essence, there is no essential difference between primary hypertension and secondary hypertension. Primary hypertension also has incentives that are not been discovered. If the inducement of primary hypertension can be found, primary hypertension would also be slowed down, prevented or even reversed by alleviating the relevant inducements.

Previous reports have clarified that vascular dysfunction is the main mechanism of vascular diseases<sup>1-22</sup>. Vascular tunica media dysfunction induced fibrous connective tissue remodeling is the main mechanism of atherosclerosis, aneurysm or stiffening<sup>1-20,22</sup>. It is well known that hypertension and vascular diseases interact with each other (Figure 1). And there are many consistent risk factors among them, such as metabolic diseases, smoking, vasculitis, aging, genetic abnormalities, rheumatic immune diseases, connective tissue diseases, environmental pollution, infection and so on (Figure 1). This

suggests that the initial factor of primary hypertension is vascular dysfunction, especially vascular tunica media dysfunction, which is mainly caused by the decrease of the function / number of smooth muscle cells (SMCs) in vascular tunica media (Figure 1). Except for venules and capillaries, SMCs are the mainly stable cells in adult blood vessels<sup>9,23</sup>. Other cells such as endothelial cells, fibroblasts and pericytes have strong ability to repair, proliferate and compensate after injury<sup>3,5,7,8,15</sup>. Various risk factors could lead to the reduction of the function / number of SMCs, which leads to tunica media dysfunction<sup>6</sup> (Figure 1). The contraction and relaxation of arteries are mainly determined by the contraction and relaxation of SMCs [Vascular simple harmonic motion(SHM)]<sup>5</sup>. Under normal physiological conditions, there are a large number of nervi vasorum innervation in the tunica media (Figure 1). The dysfunction / loss of SMCs might lead to the destruction of the function / structure of the media<sup>3</sup>, which would further reduce the function / quantity of nervi vasorum, which would further aggravate dysfunction of vascular vasodilation and contraction (Figure 1). **These might be the mechanism of primary hypertension** (Figure 1).

The routine drugs treatment of primary hypertension would not be described in this paper. **The following mainly introduces the promising etiological treatment of primary hypertension.**

1. Controlling risk factors to reduce injury / dysfunction of vascular SMCs / nervi vasorum

**Biological, chemical or physical risk factors:** metabolic diseases, aging, smoking, vasculitis, toxics, radiation, microcirculation disorders, cytoskeletal protein dysplasia,

trauma, medical injury, malnutrition, hypoxia, hypoglycemia, gene abnormality, rheumatic immune diseases, connective tissue diseases, infection, etc. (Figure 1).

2. Targeted transplantation of mesenchymal stem cells (MSC) is one of the possible methods to reverse vascular media dysfunction<sup>5</sup>.
3. Treatment of arteriosclerosis / stiffening<sup>5,20</sup>.

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