Arteriolosclerosis

Arteriolosclerosis is a form of arteriosclerosis affecting the small arteries and arterioles. This condition is characterized by thickening and loss of elasticity of the vessel walls. There are two histological forms of arteriolosclerosis. The hyperplastic form results in smooth muscle cell hyperplasia with an onion skin appearance on microscopy, and is commonly seen in malignant hypertension. The hyaline form results in subendothelial protein deposition, and may arise due to chronic hypertension, diabetes mellitus, or as part of the normal aging process.



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Characteristics

Small Arteries and Arterioles
Small Arteries and Artery-Os
Arteriolosclerosis is a form of arteriosclerosis affecting the small arteries and arterioles.

Thickening of Arteriole Wall
Thick Wall
Arteriolosclerosis is characterized by thickening of arteriolar walls and reduced elasticity. As a result, the lumen (diameter) of the arterioles and small vessels becomes narrower. This is also known as reduced vessel caliber. A narrower lumen can cause less blood flow to the organs these arterioles supply, which can progress to ischemia.

Hyperplastic Arteriolosclerosis

Hyperplastic
Hiker-Plastic
Arteriolosclerosis occurs in two histologic forms. The hyperplastic form is characterized by thickening of the arteriolar wall due to the proliferation of smooth muscle cells. These changes represent an adaptive response of arterioles to severe (“malignant”) hypertension.

Smooth Muscle Cell Hyperplasia
Smoothie Muscle with Hiker-plates
Smooth muscle cell hyperplasia is an increase in the amount of smooth muscle due to an increase in cell number. Hyperplastic arteriolosclerosis is characterized by thickening of the arteriolar wall due to the concentric proliferation (hyperplasia) of smooth muscle cells. Smooth muscle cells proliferate as an adaptive response to severe "malignant" hypertension.

"Onion Skin" Appearance
Onion
On microscopy, hyperplastic arteriolosclerosis appears as concentric, hyperplastic “onion skinning” of the walls of small arteries and arterioles. Thickening of the arteriolar wall, due to the concentric proliferation (hyperplasia) of smooth muscle cells, gives the arterioles an “onion skin” appearance.

Malignant Hypertension
Malignant-man with Hiker-BP
Malignant hypertension is extremely high blood pressure that develops rapidly and causes some type of organ damage. It is considered a medical emergency. It may arise from pre-existing, benign hypertension or de novo. Arteriolar damage caused by malignant hypertension may cause fibrinoid necrosis of the vessel walls with hemorrhage. Fibrinoid necrosis is a type of irreversible, uncontrolled cell death that occurs when antigen-antibody complexes are deposited in the walls of blood vessels. Therefore, it is considered a type III hypersensitivity reaction. Renal vessels are particularly susceptible to fibrinoid necrosis with hemorrhage, and may lead to acute renal failure and/or a characteristic "flea-bitten" appearance to the kidneys on gross exam.

Hyaline Arteriolosclerosis

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Hyaline

Highlighter

The hyaline form of arteriolosclerosis is characterized by thickening of the arteriolar wall due to the accumulation of protein.

Subendothelial Protein Deposits

Sub-In-Donut with Mr. Protein

Deposition of proteins below the endothelium due to leakage causes hyaline arteriolosclerosis, or thickening of the vessel, and is responsible for the characteristic microscopic findings. Hyaline appears as pink, amorphous deposits within the arteriolar walls on H&E staining.

Chronic Hypertension

Crone Hiker-BP

Chronic, or benign, hypertension is the term for a higher than normal blood pressure for a sustained period of time. It is clinically silent and can cause vessel and organ damage slowly over time. Chronic benign hypertension is one of the key risk factors for developing hyaline arteriolosclerosis. The high blood pressure forces proteins into the wall of the arterioles.

Diabetes Mellitus

Dyed-bead-pancreas

Diabetes mellitus is a metabolic disorder in which blood sugar (glucose) levels are abnormally high in the circulation, due to the pancreas' inability to produce enough insulin or the body's inability to effectively use the insulin it does make. Diabetes mellitus is one of the key risk factors for developing hyaline arteriolosclerosis. In these patients, there is non-enzymatic glycosylation of the basement membrane, which then makes the vessel wall leaky. Protein can then begin to leak in, under the endothelial layer.

Aging

Elderly Characters

A thickening of arteriolar walls caused by deposition of proteins below the endothelium may be seen as part of normal aging.

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