AORTIC DISSECTION

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The aorta is the largest blood vessel in the body and is responsible for supplying oxygenated blood to the rest of the circulatory system. Aortic dissection involves bleeding that forces the layers of the aortic wall apart to create an alternative route of blood flow or a 'false lumen' and is most often caused by a tear in the intimal layer of the vessel wall. Dissection of the aorta can lead to death owing to reduced supply of oxygen to organs (ischaemia) and circulatory shock.

EPIDEMIOLOGY

Dissection is the most common catastrophic event to affect the aorta, with an incidence of 3–5 cases per 100,000 individuals per year in hospital-based studies. The condition is most common in those >65 years of age and is more common in men than in women. Of those who develop aortic dissection, ~80% have hypertension, ~31% have atherosclerosis and ~5% have Marfan syndrome (a genetic condition characterized by defects in elastic fibre formation).

DIAGNOSIS

Aortic dissection is a medical emergency. As such, rapid diagnosis is important to ensure patient survival. Symptoms are nonspecific and often include 'tearing' chest pain, shortness of breath and loss of consciousness. Imaging, usually MRI or CT, is used to make a diagnosis and to assess the location and severity of the dissection.

MECHANISMS

Factors that weaken the aortic wall or decrease its elasticity can make the wall fragile and prone to dissection

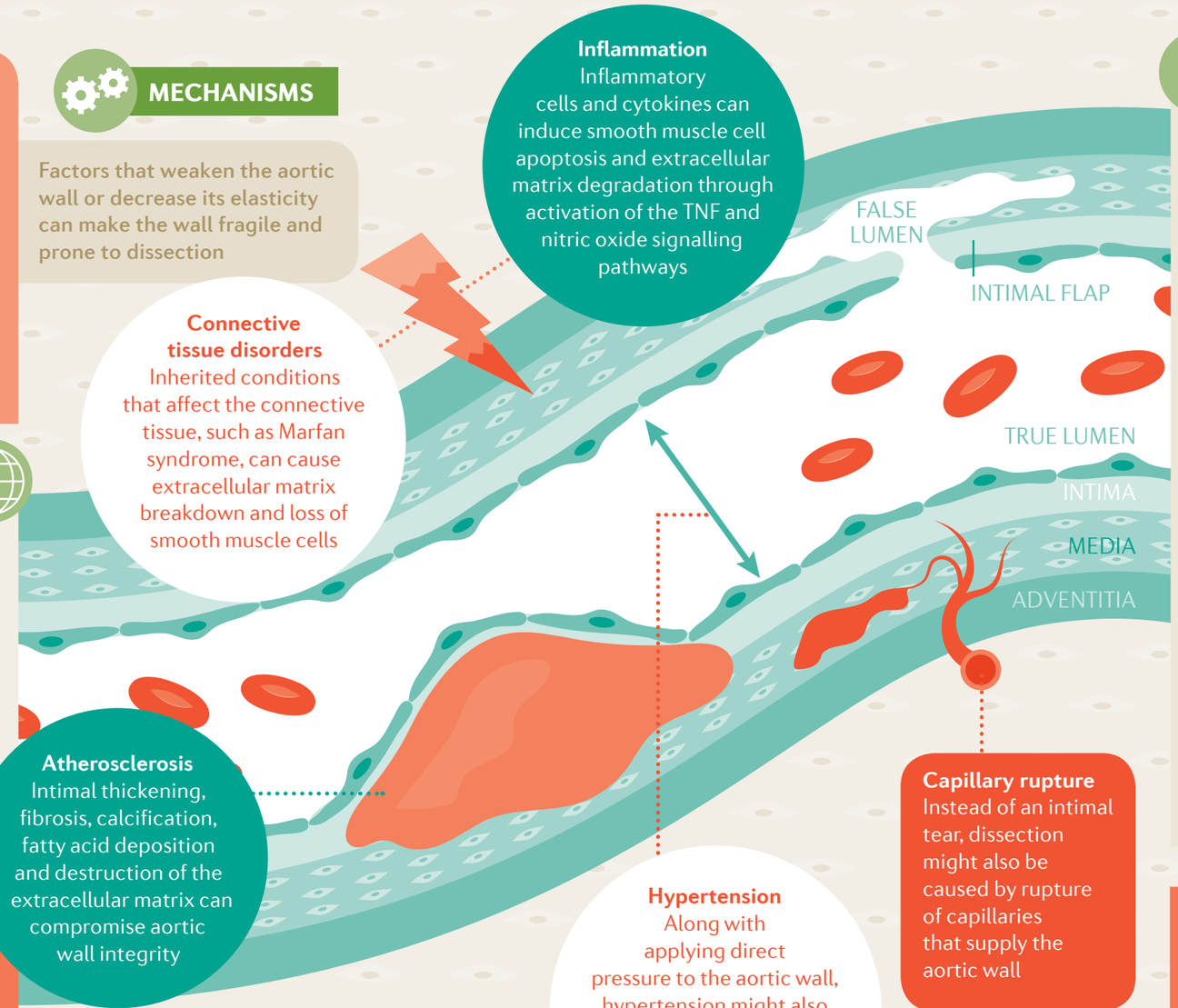
Connective tissue disorders
Inherited conditions that affect the connective tissue, such as Marfan syndrome, can cause extracellular matrix breakdown and loss of smooth muscle cells

Inflammation
Inflammatory cells and cytokines can induce smooth muscle cell apoptosis and extracellular matrix degradation through activation of the TNF and nitric oxide signalling pathways

Atherosclerosis
Intimal thickening, fibrosis, calcification, fatty acid deposition and destruction of the extracellular matrix can compromise aortic wall integrity

Hypertension
Along with applying direct pressure to the aortic wall, hypertension might also lead to the production of inflammatory cytokines and matrix metalloproteinases

Capillary rupture
Instead of an intimal tear, dissection might also be caused by rupture of capillaries that supply the aortic wall

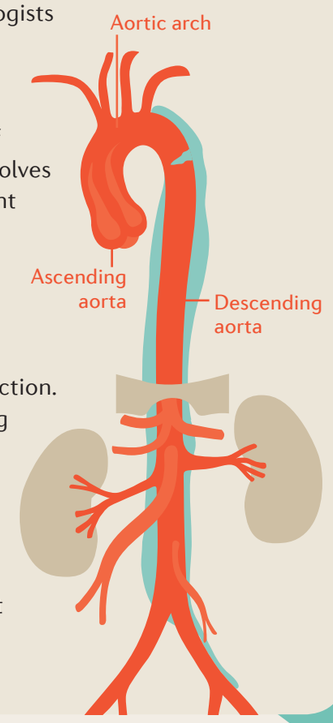


OUTLOOK

Important unmet needs in aortic dissection include early detection and the accurate and sensitive identification of patients at risk. Biomarkers currently used in research that might move to the clinic in the future include markers of inflammation (IL-6) and of damage to smooth muscle cells (calponin and smooth muscle myosin heavy chain) and the extracellular matrix (soluble elastin fragments and matrix metalloproteinases). In addition, monitoring of components of the TGFβ signalling pathway, which has been implicated in aortic dissection in genetic studies, might one day help to improve risk stratification.

MANAGEMENT

Aortic dissection is a complex vascular scenario that should be managed by an experienced team of surgeons, cardiologists and vascular interventionists in a specialized aortic centre. Treatment of aortic dissection involves repair or replacement of the damaged portion of the aorta. The technique used depends on the severity and the location of the dissection. Dissections affecting the ascending aorta and the aortic arch are usually treated surgically, whereas endovascular repair is often used to treat dissections of the descending aorta.



PREVENTION

In the general population, prevention of atherosclerosis and treatment of hypertension are important for preventing the development of aortic dissections. Patients with connective tissue disorders should receive regular screening using imaging. If dilation of the aorta is detected, which often precedes dissection, prophylactic surgery might be needed.

Based on the incidence of aortic dissection in those with hypertension, ~50% of aortic dissections could potentially be prevented by timely and effective blood pressure control

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