Compliance (physiology)

This article is about the physiological term. For other uses, see Compliance (disambiguation).

Compliance is the ability of a hollow organ (vessel) to distend and increase volume with increasing transmural pressure or the tendency of a hollow organ to resist recoil toward its original dimensions on application of a distending or compressing force. It is the reciprocal of "elastance", hence elastance is a measure of the tendency of a hollow organ to recoil toward its original dimensions upon removal of a distending or compressing force.

1 Blood vessels

The terms elastance and compliance are of particular significance in cardiovascular physiology and respiratory physiology. In compliance, an increase in volume occurs in a vessel when the pressure in that vessel is increased. The tendency of the arteries and veins to stretch in response to pressure has a large effect on perfusion and blood pressure. This physically means that blood vessels with a higher compliance deform easier than lower compliance blood vessels under the same pressure and volume conditions.[1] Venous compliance is approximately 30 times larger than arterial compliance.[2] Compliance is calculated using the following equation, where ΔV is the change in volume, and ΔP is the change in pressure:[3]

$$C = \frac{\Delta V}{\Delta P}$$

Physiologic compliance is generally in agreement with the above and adds dP/dt as a common academic physiologic measurement of both pulmonary and cardiac tissues. Adaptation of equations initially applied to rubber and latex allow modeling of the dynamics of pulmonary and cardiac tissue compliance.

Veins have a much higher compliance than arteries (largely due to their thinner walls.) Veins which are abnormally compliant can be associated with edema. Pressure stockings are sometimes used to externally reduce compliance, and thus keep blood from pooling in the legs.

2 Arterial compliance

The classic definition by Spencer and Denison of compliance (C) is the change in arterial blood volume (ΔV) due to a given change in arterial blood pressure (ΔP). So, C = ΔV/ΔP.[4]

Arterial compliance, an index of the elasticity of large arteries such as the thoracic aorta. Arterial compliance is an important cardiovascular risk factor. Compliance diminishes with age and menopause. Arterial compliance is measured by ultrasound as a pressure (carotid artery) and volume (outflow into aorta) relationship.[5]

Arterial compliance in simple words is the action in which artery yields to pressure or force without disruption. It is used as an indication of arterial stiffness. An increase in the age and also in the systolic blood pressure (SBP) is accompanied with decrease on arterial compliance.[6]

Endothelial dysfunction results in reduced compliance (increased arterial stiffness), especially in the smaller arteries. This is characteristic of patients with hypertension. However, it may be seen in normotensive patients (with normal blood pressure) before the appearance of clinical hypertension. Reduced arterial compliance is also seen in patients with diabetes and also in smokers. It is actually a part of a vicious cycle that further elevates blood pressure, aggravates atherosclerosis (hardening of the arteries), and leads to increased cardiovascular risk. Arterial compliance can be measured by several techniques. Most of them are invasive and are not clinically appropriate. Pulse contour analysis is a non-invasive method that allows easy measurement of arterial elasticity to identify patients at risk for cardiovascular events.[7]

3 Natural factors of attenuation of the reduction on arterial compliance

A study concluded that arterial compliance, which diminishes with menopause, was significantly improved with red clover isoflavones.[5] The results of another study support the hypothesis that fish oil alters vascular reactivity and favorably influences arterial wall characteristics in patients with non-insulin dependent diabetes mellitus. These direct vascular effects, expressed at the level of the vessel wall, may contribute to the cardioprotective(protective for the heart) actions of fish oil in humans.[8] Another study concluded that one important measure of arterial health, systemic arterial compliance, was significantly improved in perimenopausal and menopausal women taking soy isoflavones to about the same extent as is achieved with conventional hormone replacement therapy.[9]

4 See also

- Pulmonary compliance
- Windkessel effect

5 References

[1] Physiology: 3/3ch7/s3ch7_10 - Essentials of Human Physiology

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[3] Vascular compliance

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6 External links

- Compliance at the US National Library of Medicine Medical Subject Headings (MeSH)

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