Valsalva

The Valsalva maneuver can be used to assess autonomic reflex control of cardiovascular function. It is performed by having the subject conduct a maximal, forced expiration against a closed glottis and holding this for at least 10 seconds. When this is done, contraction of the thoracic cage compresses the lungs and causes a large rise in intrapleural (intrathoracic) pressure (the pressure measured in the space between the lungs and thoracic wall). This rise in intrapleural pressure compresses the vessels within the chest. Aortic compression results in a transient rise in aortic pressure (Phase I), which causes a reflex bradycardia due to baroreceptor activation. Because the thoracic vena cava also becomes compressed, venous return to the heart is compromised, resulting in a large fall in cardiac output. This leads to a secondary fall in aortic pressure (Phase II), and as aortic pressure falls, the baroreceptor reflex increases heart rate. After several seconds, arterial pressure (both mean and pulse pressure) is reduced, and heart rate is elevated. When the subject begins breathing again, the sudden loss of compression on the aorta can cause a small, transient dip in arterial pressure and further reflex increase in heart rate (Phase III). When compression of the vena cava is removed, venous return suddenly increases causing a rapid rise in cardiac output several seconds later which leads to a transient increase in arterial pressure (Phase IV). Arterial pressure overshoots during Phase IV because the systemic vascular resistance is increased due to sympathetic activation that occurred during Phase II. Heart rate reflexively decreases during Phase IV in response to the transient elevation in arterial pressure.

Similar changes occur whenever a person conducts a force expiration against either a closed glottis or high pulmonary outflow resistance, or when the thoracic and abdominal muscles are strongly contracted. This can occur when a person strains while having a bowel movement. Similar changes can also occur when a person lifts a heavy weight while holding their breath.