The ratio of systolic blood pressure at the ankle to arm systolic pressure (ankle-brachial index - ABI) is used in the diagnosis of peripheral vascular disease. While its reduced value suggests obstruction of the arterial lumen, an abnormally elevated value is due to incompressibility of lower extremity arteries. While increased stiffness of the aorta, measured as carotid-femoral pulse wave velocity, is able to predict cardiovascular risk, increased pulse wave velocity of the leg arteries has no independent predictive value. Despite that, incompressibility of lower extremity arteries, diagnosed using ABI measurement, is independently associated with increased cardiovascular risk. The aim of our study was to determine the relationship between the characteristics of lower limb arteries and aortic stiffness, and their impact on cardiovascular risk. Our study showed that the results of oscillometric and Doppler ABI measurement methods are not interchangeable, because the oscillometric method systematically overestimates low values and underestimates high ABI values. Therefore, the diagnosis of lower limb arteries incompressibility should be based on the Doppler method of ABI measurement. Furthermore, we showed that age and cardiovascular risk factors have only a small effect on lower extremity arteries, but a major effect on aortic stiffness. In our study, increased ABI as a sign of lower extremity arteries incompressibility, was associated not only with increased lower extremity arterial stiffness but, also, with increased aortic stiffness. This suggests that one of the mechanisms of increased cardiovascular risk in people with lower extremity arteries incompressibility can be increased rigidity of the aorta, which, by increased aortic impedance, increases systolic blood pressure in the aorta resulting in increased left ventricular afterload and, subsequently, left ventricular hypertrophy. Interventions aimed at reducing aortic stiffness in patients with high ABI could possibly reduce their cardiovascular risk.