Atherosclerosis is a multifactorial disease manifested in the accumulation in the artery wall of protein-lipid components, collagen, inflammatory cells. The last stages is characterized a sharp decrease in blood flow, due to a decrease in the lumen of the artery. Atherosclerosis is the leading cause of cardiovascular diseases (myocardial infarction, strokes, etc.) and as a consequence the leading worldwide cause of death [1]. Atherosclerosis is a chronic disease that has been developing asymptptomatically for decades. The first visible clinical signs can be seen only in the last stages of atherosclerosis, when the greater part of the lumen of the vessel is occluded [2,3].

The process of formation of atherosclerotic plaques occurs in following stages:

- The appearance of lipid spots at the first stage is due to the deposition of lipid-protein complexes of blood plasma in a thin layer of the inner shell of the arteries [4]. Later on these spots can develop atherosclerotic plaques. The accumulation of lipoproteins in the inner shell of the artery is promoted by an increased concentration of cholesterol in the plasma, damaged endothelium, etc [5].

- Lipoprotein complexes are partially bound to the intercellular substance. Then there is oxidation, which causes local inflammation. Inflammation causes the attachment of blood plasma leukocytes. Phagocytizing lipoproteins, macrophages are converted into xantom cells. This contributes to the thickening of the intima, the accumulation in it the components of blood plasma, collagen and inflammatory cells. A lipid-rich atheromatous mass appears after xantom cells die [6].

- Initially, the plaque slowly grows almost without narrowing the lumen of the vessel. However, over time, its growth accelerates and it significantly narrows the lumen of the vessel.

- In the late stages of atherosclerosis, small ruptures appear on the surface of the plaques causing adhesion of the blood and fibrin elements, which narrow the lumen even more. It is the main mechanism of thrombi formations [7]. Atherosclerosis affects vessels of different calibers, but mainly
arteries of large and medium caliber 1 – 3cm (they constitute 90 – 95% of the lesion).

The main research methods used in medicine, allowing to assess the progress of the degree of artery lumen narrowing due to atherosclerosis:
1) duplex ultrasound of blood vessels allows to detect the volume of blood and artery damage [8];
2) magnetic resonance angiography allows to estimate the sizes of atherosclerotic masses and the degree of narrowing of the vessel lumen [9];
3) computed tomography allows to obtain layered "slices" of the artery, to estimate the degree of occlusion with atherosclerotic masses. It is often used together with angiography;
4) proper angiography makes it possible to determine the volume of the blood stream in the vessel after the administration of the radiopaque substance [10].

The pathological growth of blood vessel wall can be described in some cases by surface growth mechanics technique. At present study we will focused on the processes of surface growth of thin-walled vessels. We use the ideas of the mechanics of growing solids developed in [11–14]. Some problems in frameworks of the thermoelastoplasticity are studied for the same symmetries conditions in [15–23]. The principal variables of the boundary value problem for a growing body are the stress rate tensor, the strain rate tensor and the velocity vector. On the surface of growth we set a specific boundary condition depending on the curvature tensor of the growth surface and the tension and inflow rates of the incremented elements.

Some problems for an elastic thick-walled surface-growing cylinder are considered at present work. The condition of thickness allows us to study finite displacements of cylinder points under the condition of small deformations. This, in particular, makes it possible to solve the problem with exact boundary conditions on a moving surface.

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