SUMMARY

The miniinvasive methods of the application of scaffolds for various indications are known for their high safety of a medical treatment. These methods also have some disadvantages, as it is stated in many studies and international conferences. The most typical cases of these disadvantages are leakage, shift, and crack of the scaffold. It is caused by the design of the scaffold most frequently. Such a design does not respect mechanical properties, geometry, and dynamics of changes of a living organism it the place of the application. The aim of the dissertation thesis is to develop a complex mathematical model of the spiral stent and to develop and realize the measurement methods and set-ups. The mathematical model should describe the deformation properties of the spiral stent. The measurement methods should enable the spiral stents to be custom designed according to the biomechanical properties of the biological system. This should be possible in the connection with the mathematical model and simulation process at the place of application of the spiral stent. I developed such an "exact" mathematical model in my dissertation work. My model enables the prediction of the behavior of the spiral stent and it gives the possibility of the spiral stent to be custom designed for a concrete patient. My model enables also to perform the easier and more exact measurement of the axial force F_Z depending on the total length of the spiral stent L. Then, using the proper transformations, my model determines the radial force F_R and the radial pressure p_R depending on the total radius of the spiral stent R. The spiral stent acts on the tissue by the radial pressure p_R. My model is also the keystone of the corresponding research about the relationships between the spiral stent and the tissue. My model always corresponds to the real situation for small deformations of the spiral stent and for large deformations as well. It also gives the values of the physical quantities describing the mechanical properties of the material of the spiral stent.