COMPARISON OF DIFFERENT NUMERICAL METHODS IN BIOMEDICAL APPLICATIONS

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The authors in the presentation in pairs (format 1) want to show their research in the biomedical area using numerical methods. Numerical methods are a very useful tool that allows one to perform investigations in a faster and less expensive way. In the case of numerical simulations, there is no need to fabricate components, a well-executed computation gives the same results as an experiment carried out on a real object.

The first author presents the results of research on bioresorbable stents. In the work, the author performed numerical simulations of the stent crimping and opening process on the catheter. The strength of the element during these processes is crucial because in order to place it in a blood vessel, the stent (produced in an open form) has to be closed on a catheter and introduced into the patient's body. Simulations of stent compression longitudinally and transversely (pinch) have also been performed. This allows to determine the stent strength during the implantation process, when it is moved through different blood vessels to the target place, and during the time when it already works with the artery and must adequately support it against the generated radial force.

The second author presents modeling the cryopreservation of biological tissue. The mathematical and numerical model of this process prepared by the author is a coupled problem, which includes, e.g., changes of temperature and cryoprotectant concentration in the tissue. Additionally, thermophysical parameters were introduced into the model as interval numbers. This allows the simulation performed to better reflect the actual behavior of the tissue, which depends on many factors and circumstances, bypassing both the simplified deterministic model and the time-consuming stochastic approach.

REFERENCES

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