

Computer Simulation of Anesthetic Propagation during Epidural Anesthesia

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A mathematical model of the anesthetic solution transferring for a patient's epidural anesthesia after its injection through a catheter into the epidural space of the spinal cord is considered. By means of the method of solving contact-boundary value problems of convection-diffusion in binary regular structures using integral transforms for the spatial variables separately in contacting domains [1], exact solutions are obtained for two contact-boundary value problems defined within this model. On the basis of the obtained solutions, a software is developed for computer simulation of mass transfer of the solution for epidural anesthesia through the intervertebral holes to determine a necessary dose of this solution, its component composition, the ratio of its volume to the concentration depending on the age of the patient to achieve an adequate level of anesthesia. It is established that for the elderly patients, i.e. when the convection diffusion rate of the drug is decreased, the dose of anesthetic should be reduced accordingly.

- [1] Ye. Ya. Chaplya, O. Yu. Chernukha, V. Dmytruk *Advective-diffusive mass transfer in binary regular structures in the steady-state regime* **37**, (2013), p. 6191-6211.