Blood flow simulation for nanomedicine design by immersed finite element method

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ABSTRACT

Nanomedicine is a drug-delivery system which can make nanoparticles accumulated in diseased area. For optimizing the nanomedicine, it is crucial to understand nanoparticle transport in the human circulatory system. However, it is challenging to predict the nanoparticle transport mechanism only by in vivo experiments. Therefore, in silico model (or computer simulation) is helpful to unveil the nanoparticle transport in the microvasculature. In this talk, blood flow simulation with cellular interactions is suggested to capture nanoparticle movement in the microvasculature. Then, for the validation of blood flow simulation, it is compared with several experimental data such as tensile test of single cell, thickness of cell free layer, and apparent viscosity of blood along with hematocrit level. As a result, the validated simulation method is applied to predict the size and shape effects in nanoparticle dispersion in the microvasculature [1,2]. Furthermore, current research topics including circulating tumor cell (CTC) transport and uncertainty quantification of microvasculature are briefly introduced in the end of the presentation.

REFERENCES

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