



UvA-DARE (Digital Academic Repository)

Platelet aggregation in complex vessel geometries

An in silico study on cellular blood flow mechanics

Spieker, C.J.

Publication date

2024

[Link to publication](#)

Citation for published version (APA):

Spieker, C. J. (2024). *Platelet aggregation in complex vessel geometries: An in silico study on cellular blood flow mechanics*. [Thesis, fully internal, Universiteit van Amsterdam].

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, P.O. Box 19185, 1000 GD Amsterdam, The Netherlands. You will be contacted as soon as possible.

Appendix C

Carotid Artery Stent Design Comparison

This appendix contains supplementary material for Chapter 4. Figure C.1 presents the 1D velocity profiles from the COMSOL simulations of the entire stented segments. The average velocity at 250 μm from the wall (2.75 mm radial distance) is applied as the velocity boundary condition of the respective cellular microscale simulation. Figure C.2 displays the standard deviations (SDs) of the average cell volume concentration plots shown in the chapter in Fig. 4.7. The flow profiles and superimposed streamlines of Fig. C.3 result from a recreation of the microscale geometry used in the cellular simulations in COMSOL. The continuum fluid simulations show qualitative similarity to the streamline plots of the cell-resolved simulations in Fig. 4.6; however, they do not inform about cell free regions or deposition zones. Still, these simulations seem suitable when only the overall flow profile is important.

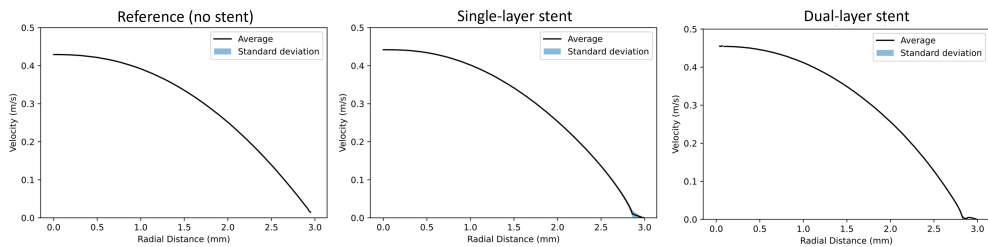


Figure C.1: Macroscale COMSOL Multiphysics simulation results: Averaged 1D velocity profile in the *reference*, *single-layer* and *dual-layer* case.

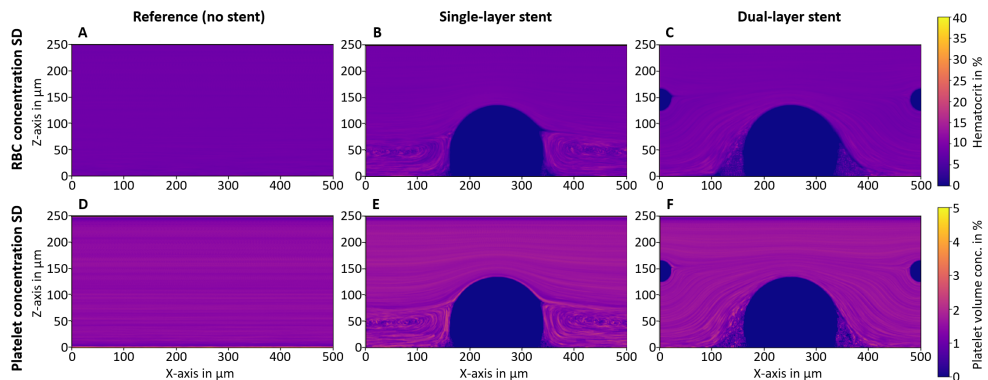


Figure C.2: Cell volume concentration standard deviation (SD) across X- and Z-axis for the (A) *reference* (no stent), (B) *single-layer* and (C) *dual-layer* stent, respectively. SDs stem from averaging across the Y-axis and over multiple time steps. Flow is driven in positive X-direction.

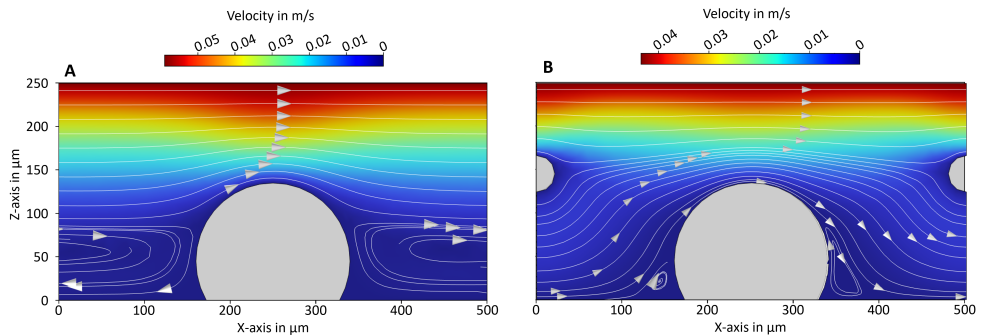


Figure C.3: Microscale COMSOL Multiphysics simulation results: Fluid streamlines superimposed on cross-sectional velocity profile for *single-layer* case in A and *dual-layer* case in B. The results are qualitatively matching the HemoCell streamlines in Fig. 4.6. Dynamic viscosity adjusted to 2.5 mPas to match lower local hematocrit of 25% [29, 208].