Patient- Specific Blood Flow Simulations for Clinical Insights and Applications

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Abstract

Cerebrovascular disorders such as stroke or subarachnoid hemorrhages are serious diseases with relatively high mortality rates. Patients with severe cerebrovascular disorders may require surgery, a complex process that can sometimes result in complications. Therefore, to facilitate appropriate surgical planning and treatment, a patient-specific simulation [1] is a promising method, and its clinical applications have been investigated. One of the major cerebrovascular disorders, cerebral aneurysm tends to be initiated at preferential locations in cerebral arteries where wall shear stress becomes higher. Our study aims to investigate the relationship between vascular geometry and hemodynamics using PCA (Principal Component Analysis) and geometric parameters such as curvature and torsion [2] as shown in Fig.1. The talk also will touch upon the effects of uncertainties in the medical data on simulation results based on a data-driven approach with machine learning techniques [3].

Keywords: Patient-Specific Simulation, Cerebrovascular Disorders, Geometric Analysis, Multi-Scale Simulation, Hemodynamics

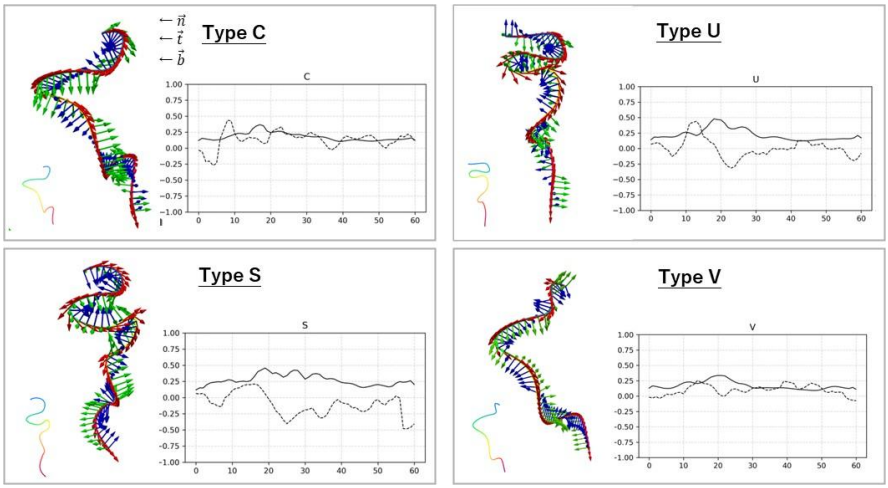

Figure 1. Geometric Analysis of Cerebral Major Artery

References

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