

OSHIMA LAB.

[Bio fluid mechanics, micro-fluid and biochemical system]

Department of Mechanical and Biofunctional System /
Center for Research on Innovative Simulation Software

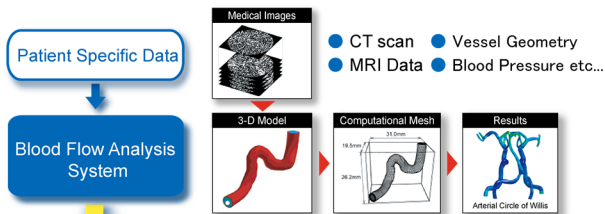
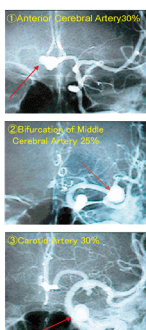
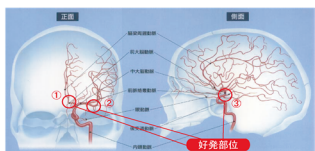
<http://www.oshimalab.iis.u-tokyo.ac.jp/>

Department of Mechanical Engineering /
Interfaculty Initiative in Information Science

Computational Fluid Dynamics

Investigation of Bio/Micro-fluid Mechanism

- The 2nd highest rate of death in Japan
 - Cerebrovascular disorders
 - ➔ 10%-subarachnoid hemorrhage
 - ➔ 90%-rupture of cerebral aneurysm
 - Characteristics in formation of aneurysm
 - Preferential location such as bend, bifurcation
 - Preferential age groups between 40's and 50's
- ➔ Any relation between vessel geometry and aneurysm ?



- Research Aim**
- Investigation of the effects of vessel geometry on the hydrodynamics
 - Development of an integrated hemodynamic simulation system for clinical diagnosis

Computational

Development of an image-based modeling system to Investigate Evolution of the Morphological Changes of a Vessel

- Three Dimensional Vessel Geometry Modeling System
- Measurement of Shape Change of Cerebral Aneurysm

right internal carotid artery		
	2009 / 10	2013 / 3
shape		
depth	1.76mm	1.91mm
diameter	3.09mm	3.04mm

Measurement of Radius in Cross Section and Vascular Length | Smoothing of Surface and Vertical Cutting

Cerebral Circulation Simulation Taking Account of Whole Circulatory System

- Simulation of Systemic and Cerebral Circulation
- Numerical Model
- Visualization System for 1-D Model

Pressure force on arterial inner wall

Numerical Investigation of External Carotid Artery and Airway

- Intra-Arterial Infusion Chemotherapy for Oral Cancer
- Upper Airway Simulation

External Carotid Artery | Simulation of Drug Delivery | Change in air flow conditions

Experimental

Stereoscopic PIV Measurement in Cerebral Artery Model

- Cerebral Artery Model
- Velocity Distribution at Maximum Inflow

Model Dimension: D140 x W110 x H80mm | Material: Silicon

Quantitative Evaluation of Blood Vessel Damage

- Effect of High WSS
- Damage of Endothelial Cells Under WSS

Low WSS | High WSS

Micro-PIV Measurement of Micro-Multiphase Flow

- Simultaneous Measurement of Red blood cells and Surrounding Fluid
- Measurement of Water Droplet Formation Mechanism in Oil Flow

Tank Treading Movement and Velocity Distribution around | Velocity Distribution at Droplet Formation | 3D Reconstruction of Flow Fields