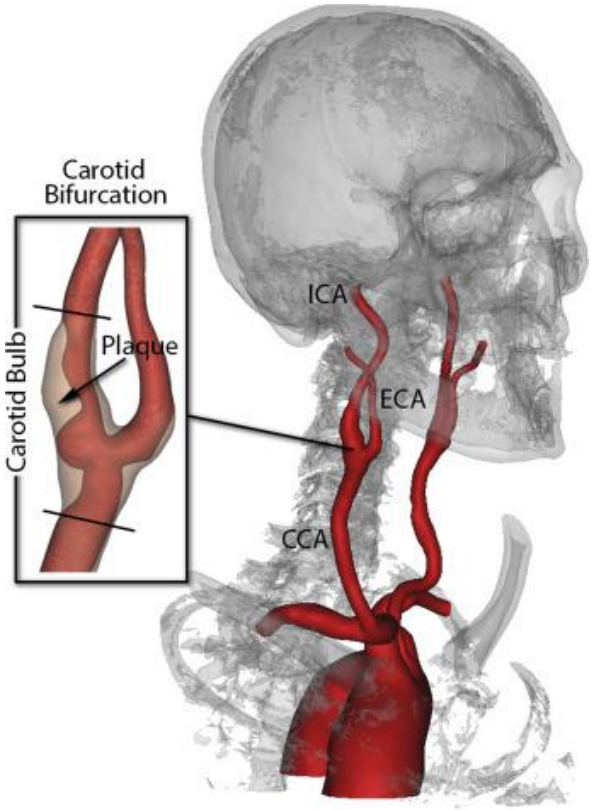
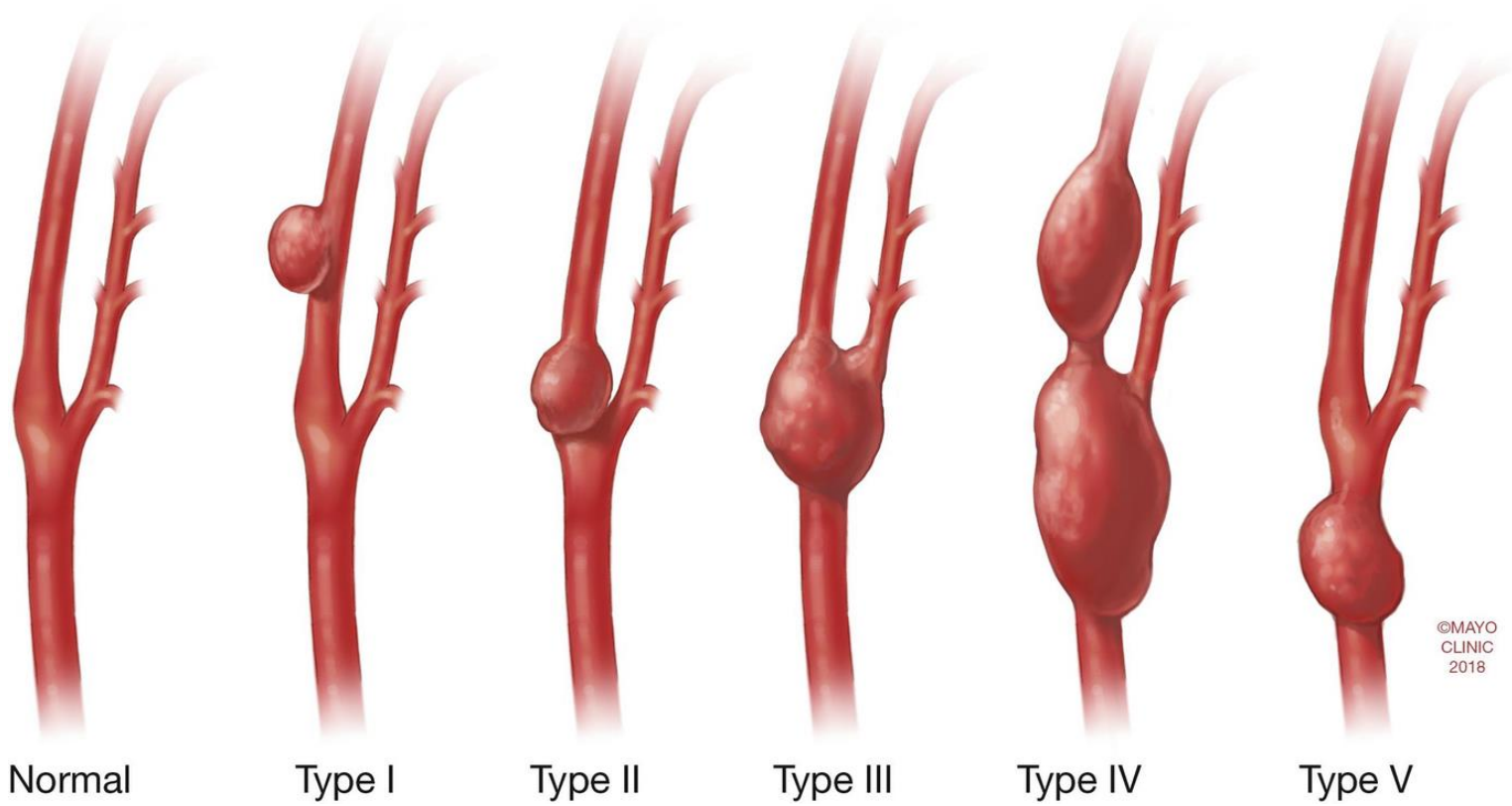
Overview

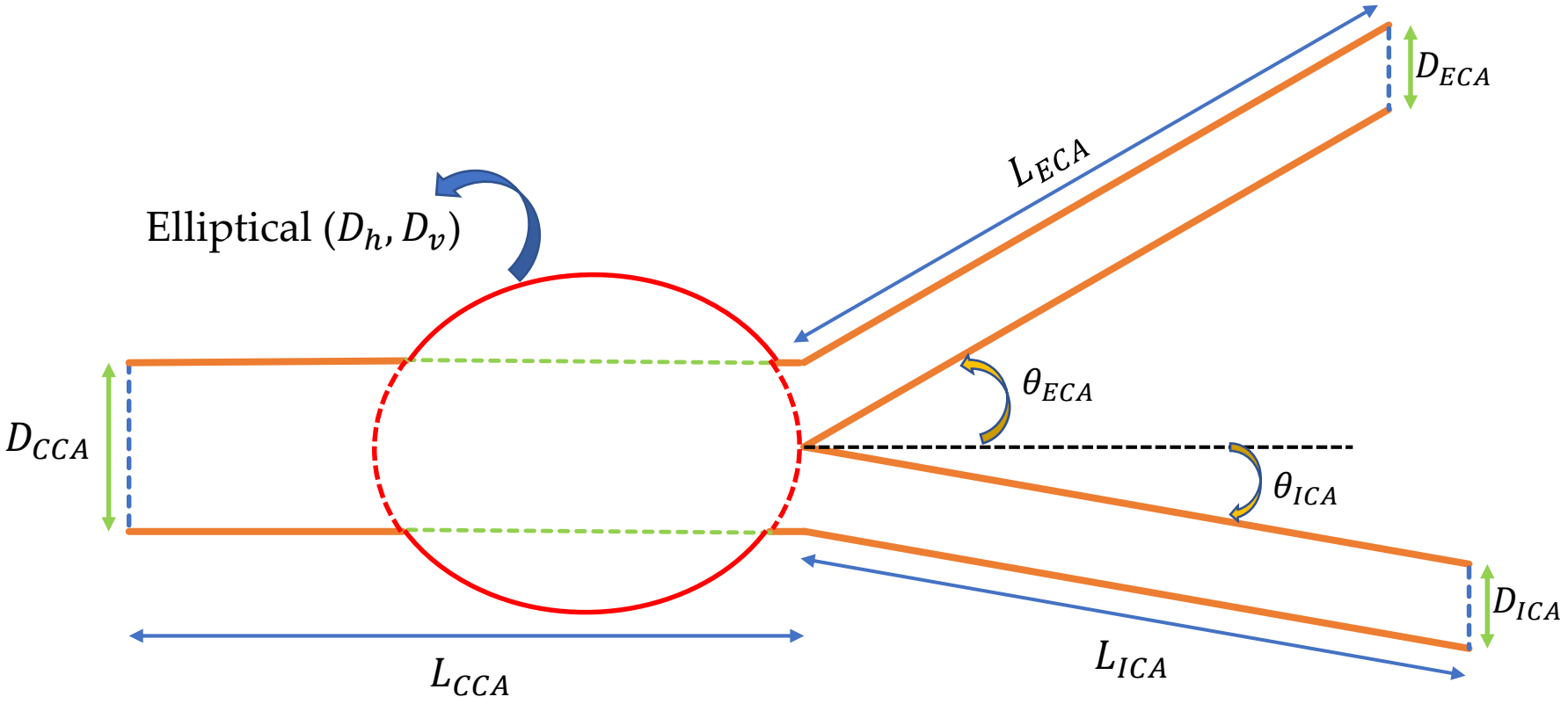
1. Import mesh
2. Swak4foam-groovyBC
3. Residual
4. Sample

Example 2: Carotid bifurcation aneurysm





Geometry



Abbreviations

CCA: Common carotid artery

ECA: External carotid artery

ICA: Internal carotid artery

CB: Carotid bifurcation

D: Diameter

L: Length

h: Horizontal

v: Vertical

Assumptions and governing equations

Assumptions: Laminar, incompressible, steady, ignore gravity, Newtonian viscosity, 2-D

Mass conservation

$$\nabla . \vec{V} = 0$$

Momentum conservation

$$\rho \nabla . \left(\vec{V} \times \vec{V}\right) = -\nabla P + \nabla . \left(\mu \nabla \vec{V}\right)$$

Symbols

$\vec{V}$: Velocity vector $(\frac{m}{s})$

P: Pressure (Pa)

ρ: Density $(\frac{kg}{m^3})$

μ: Dynamic viscosity $(\frac{kg}{m.s})$

Dimension and Properties

Dimension

Name	Value
D_{CCA}	D
L_{CCA}	$4D$
D_{ECA}	$D/2$
L_{ECA}	$4D$
θ_{ECA}	30
D_{ICA}	$D/2$
L_{ICA}	$4D$
θ_{ICA}	10
D_h	$2.5D$
D_v	$2D$
D	$1\ cm$

Blood properties

Name	Value
ρ	1060
μ	4.24
U_{avg}	4.0

Boundary conditions

Abbreviations

BC: Boundary conditions

B.Cs of Velocity

	Inlet	Outlet	Walls
Type	Uniform	Hydrodynamically developed	No slip
Value	$\vec{V}.\hat{n} = U_{avg}\left[1-\left(\frac{r}{R}\right)^2\right]$	$\nabla\vec{V}.\hat{n} = 0$	$\vec{V}$=0

B.Cs of Pressure

	Inlet	Outlet	Walls
Type	Developed	Atmosphere	Zero gradient
Value	$\nabla P.\hat{n} = 0$	$P = 0$	$\nabla P.\hat{n} = 0$

Residual

$$Res = \frac{\text{Previous} - \text{Now}}{\text{Previous}} = \frac{x^{n-1} - x^{n}}{x^{n-1}}$$

Under-relaxation

$$x^{n}{}_{m} = x^{n-1} + \alpha(x^{n} - x^{n-1}) = \alpha x^{n} + (1-\alpha)x^{n-1}$$