**Resistance outlet boundary condition**

Resistance was defined as a constant relationship between average pressure and flow, P = QR (Westerhof et al., 2009). We assume that the pressure in the downstream region was constant over the cross-sectional area of the inlet boundary. According to the law of diameter flow (Huo and Kassab 2009, Huo and Kassab 2012), the blood flow at outlet i (the time average of the cardiac cycle) was estimated as:

(6)

(7)

where N is the total number of outlets of arterial trees reconstructed from CTA images and (time-averaged over a cardiac cycle) is the outlet flow velocity. A steady-state flow simulation was carried out with the inlet pressure of and outlet flow velocity, where is the time-averaged aortic pressure over a cardiac cycle and the zero-flow pressure, , was set to 51 mmHg (Dole et al., 1984). The pressure at outlet i, (time-averaged over a cardiac cycle), was obtained from the steady-state computation. The resistance at each outlet of arterial tree, , can be determined as:

(8)

In the transient flow simulation, was assumed to be constant. Hence, we obtained the following equation as:

(9)

where Poutlet and Voutlet refer to the transient pressure and flow velocity, respectively, at each outlet of arterial tree. Equation [7] was used as the transient resistance boundary condition with Voutlet and Poutlet being the transient variables in a cardiac cycle.

**Hemodynamic Parameters:**

The shear component of was expressed as follows:

(10)

Where is the shear rate tensor. The stress on the wall, its normal component, and its two tangential components can be written as, respectively:

(11)

and

where , , and are the unit vector in the normal and two tangential directions, respectively. The shear component of has the vector form:

(12)