FLUENT - Bifurcating Artery

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2D Bifurcating Artery

Created using ANSYS 14.5

Problem Statement

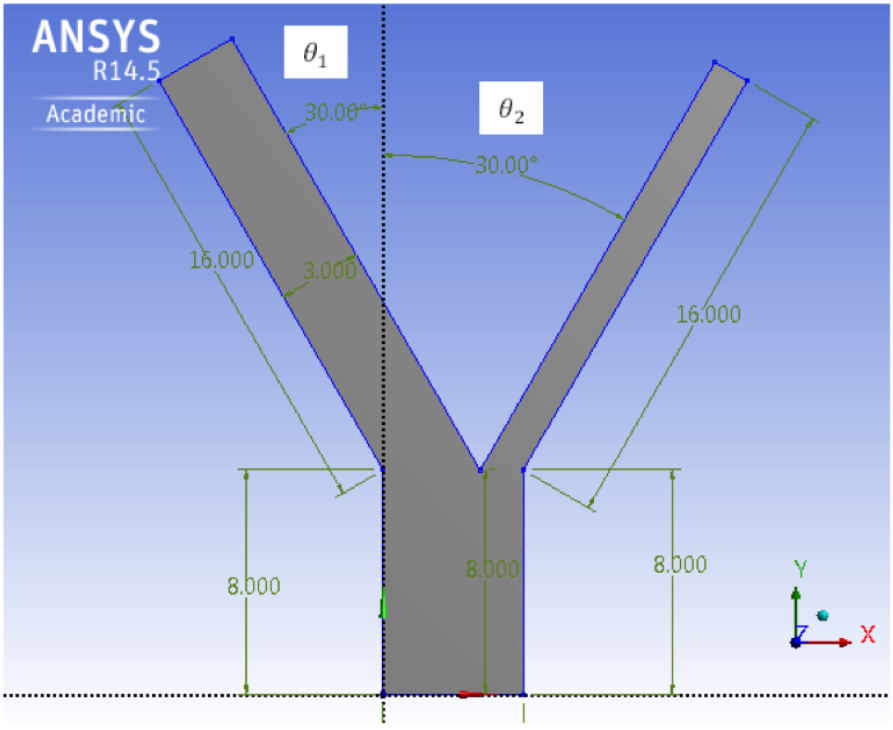
You will simulate blood flow in an idealized bifurcated blood vessel using ANSYS FLUENT®, a commercially available CFD software package. You will study:

- The effect of fatty plaque on the blood flow
- The effect of a blood clot in addition to the fatty plaque

You will be calculating the velocity, wall shear stress and pressure gradient for the cases outlined below.

Geometry

We'll ignore 3D effects and use the following idealized 2D geometry. All dimensions are shown in mm.



Consider the following two plaque configurations. Model the plaque as a circular arc with a diameter of 3 mm except the one that spans two limbs whose dimensions are shown below.

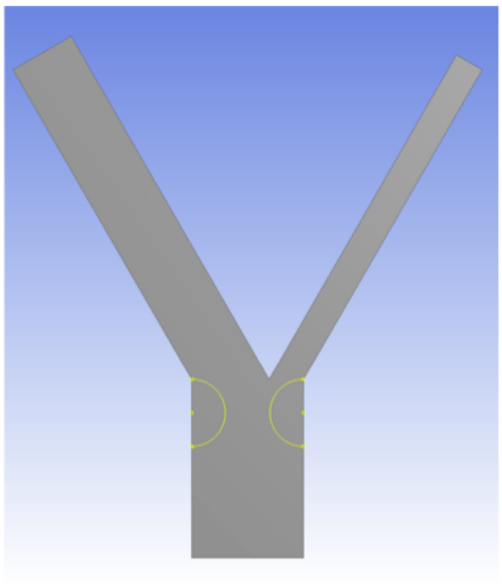


Figure 1: Plaque configuration #1.

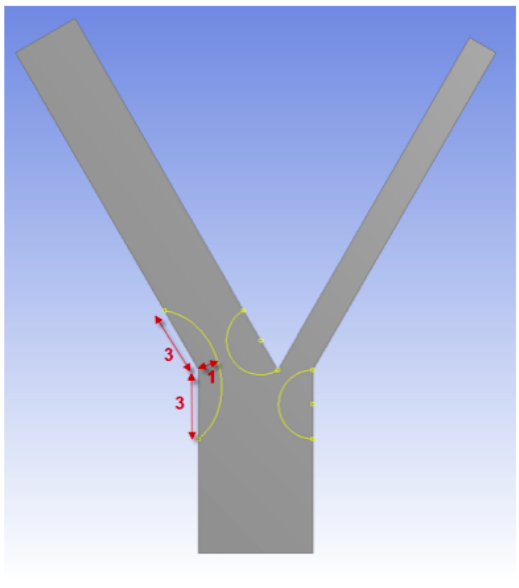
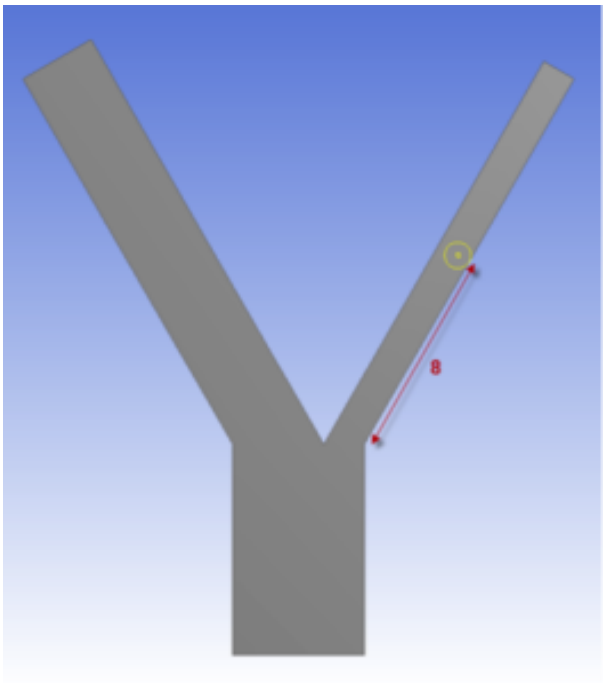


Figure 2: Plaque configuration #2.

You also need to study the effect of a blood clot in the right branch (in addition to the plaque) as shown in the figure below. Assume that the blood clot has a diameter of 1 mm.



FLUENT Inputs

- Steady 2D flow
- Outlet gauge pressure = 0 Pa
- Density = 1000 kg/m^3
- Coefficient of viscosity = 0.001 kg/(m-s)
- Adjust inlet velocity to get a Reynolds no. of 400.

Cases to be studied

1. No plaque
2. The above two plaque configurations without blood clot
3. The above two plaque configurations with blood clot

4. Consider two combinations of

   β_1

   and

   β_2

   .

   - $\beta_1 = 30^\circ \quad \beta_2 = 30^\circ$
   - $\beta_1 = 30^\circ \quad \beta_2 = 15^\circ$

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