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Abstract
The impeller type left ventricular assist device (LVAD) uses rotating impeller pumping blood. It mainly falls two categories. They are the one with centrifugal type impeller and that with axial-flow impeller. The study concentrates on centrifugal type impeller design of the LVAD. Three impeller designs have been proposed. They are an independent rotating impeller, an impeller fastened on a rotating plate, and an impeller located on a casing of rotating plate pair. Flow analysis around the impeller is performed by using the finite volume method to solve the fully incompressible three-dimensional Navier-Stokes equations. We adopt the software of CFX 4.3 and CFX-TASCflow to simulate the flow pattern and shear stress under different flow conditions. Results provide a comprehension of flow velocity, pressure and shear stress distribution of the flow domain for the designs. Performances of the three designs are evaluated by the comparison of the corresponding flow rate - rotation speed - pressure curves. On the other hand, shear stress is evaluated and a detailed comparison of the shear stress field of the three designs is demonstrated as well.
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