

عنوان مقاله:

Numerical simulation of age-related stiffening of arterial wall to study flow field parameters

محل انتشار:

سیزدهمین کنفرانس مهندسی پزشکی ایران (سال: 1385)

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خلاصه مقاله:

In this study the interaction of blood flow with arterial wall has been investigated using FSI (Fluid-Structure Interaction) modeling. Computer simulation of pulsatile blood flow was carried out on the basis of the time dependent axisymmetric Navier-Stokes equations for incompressible Newtonian fluid flow. An elastic incompressible material with large deformation was considered for arterial wall and momentum and continuity equations of elastodynamics have been solved. The specified boundary conditions for the Navier- Stokes equations were pulsatile pressure waveform of brachial artery at inflow and outflow to the given pulse wave form of a cardiac cycle. Fluid and solid equations were solved with ALE-based loose coupling method for FSI problems. Resultant flow, wall shear stress and wall displacement waves were determined. Stiffening of the arterial wall resulted in significant decrease in mean values of flow and wall shear stress and altered waveforms. Ten fold increase in wall stiffness cause 37% drop in flow and negative values of shear stress in 21% of pressure pulse. For elastic moduli corresponding to wall displacement less than 1% the blood flow and wall shear stress were not sensitive to wall stiffness. It was concluded that FSI modeling with pressure boundary conditions provides a proper evaluation of hemodynamic parameters determining endothelial injury.

کلمات کلیدی:

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