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Features of the blood flow in the helical-like curved vessels

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Mathematical simulation of the blood flow in the pathologically planar curved and non-planar curved blood vessels was performed. Influence of degrees of the curvature by the intensity and the features of the secondary and the reverse blood flow in the vessels at different times cardiac cycle was determined. The most significant secondary flow features comprise the generation of non-plane Dean vortices in braking phase of period of the pulsating, as consequent, forming difficult 3D structure of vorticity. The study has indicated that the dominant geometric effects on secondary flow arise in models with uniform number of Dean. Hence, this model has minimal loss of power that is evidence of the stabilizing role Dean's vortex for flow in the curved pipes. Investigation demonstrated that non-planar geometry of the curved channel modifies the features of the flow. This phenomenon has as negative as positive influence on the flow in the blood vessels. Positive influence consists in creating uniform profile velocity. The formation of the swirling flow for some geometry types of 3D curved channel is negative part of this effect. In conclusion note that Dean's number is not completely describing flow in tightly curved channel with altered curvature. For example, value Dean's number that were calculated for inner radius, central radius and outer radius have wide range of alteration.