Rheologic Properties and Clinical Restenosis in Angulated Coronary Stenosis after Stenting

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Backgrounds :

The present study in angulated coronary stenosis was to evaluate the influence of flow velocity and wall shear stress (WSS) on coronary atherosclerosis, the changes of hemodynamic indices following coronary stenting, as well as their effect of evolving in-stent restenosis using human in vivo hemodynamic parameters and computed simulation qualitatively and qualitatively.

Methods :

Initial and follow -up coronary angiography in the patients with angulated coronary stenosis were performed (n=60). Optimal coronary stenting in angulated coronary stenosis had two models : < 50 % changed (model 1, n=33), > 50% changed group (model 2, n=27) according to percent change of vascular angle between pre- and post-stenting. Flow-velocity wave obtained from in vivo intracoronary Doppler study data was used for in vitro numerical simulation. Spatial and temporal patterns of flow-velocity vector and recirculation area were drawn throughout the selected segment of coronary models. WSS of pre/post-intracoronary stenting were calculated from three-dimensional computer simulation.

Results :

Follow-up coronary angiogram demonstrated significant difference in the percent of diameter stenosis between two groups (model 1 : 40.3(30.2 vs. model 2 : 25.5(22.5%, $p < 0.05$). Negative shear area on 3D simulation, which is consistent with recirculation area of flow vector, was noted on the inner wall of post-stenotic area before stenting. The negative WSS was disappeared after stenting. High spatial and temporal WSS before stenting fell into within physiologic WSS after stenting.

Conclusions :

The present study suggest that hemodynamic forces exerted by pulsatile coronary circulation termed WSS might affect on the evolution of atherosclerosis within the angulated vascular curvature. The local recirculation area, which has low or negative WSS, might lead to progression of atherosclerosis. Moreover, geometric characteristics, such as angular difference between pre/post-intracoronary stenting might define optimal rheologic properties. and for vascular repair after stenting. Optimal rheologic properties may induce favorable vascular repair following stenting.

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