EFFECTS OF STENT DESIGN ON LDL ACCUMULATION AT THE CAROTID ARTERY BIFURCATION

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Abstract:
Restenosis typically occurs in regions of low and oscillating wall shear stress which also favours the accumulation of atherogenic macromolecules such as low-density lipoprotein (LDL). This study aims to determine how stent strut design may affect in-stent restenosis at the carotid artery bifurcation following carotid artery stenting (CAS) by means of computational simulation. LDL concentrations were compared for post-stent carotid and the contralateral models reconstructed from patient-specific images. Our results show that closed-cell stent designs are more likely to create atheroprone and procoagulant flow conditions than open-cell designs due to larger area exposed to high LDL concentration.

Keywords : Stent Design; Carotid Artery Stenting; Low-Density Lipoprotein

REFERENCES

[1] L.H. Bonati, et al. Long-term outcomes after stenting versus endarterectomy for treatment of symptomatic carotid stenosis: The International Carotid Stenting Study (ICSS) randomised trial. Lancet 385:529–538, 2015.

[2] B. Alparslan, et al. The Effect of Stent Cell Geometry on Carotid Stenting Outcomes. Cardiovasc. Intervent. Radiol, 39:507–513, 2016.

[3] C. Timaran, et al. Randomized clinical trial of open-cell vs closed-cell stents for carotid Stenting and effects of stent design on cerebral embolization. J. Vasc. Surg., 54:1310–1316, 2011.

[4] De. Santis, et al. A computational study of the hemodynamic impact of open- Versus closed-Cell stent design in carotid artery stenting. Artif. Organs, 37:96–106, 2013.

[5] T. Gundert, et al. Optimization of Cardiovascular Stent Design Using Computational Fluid Dynamics. J. Biomech. Eng., 134:11002, 2012.