Computer Modelling of Coronary Bifurcation Stenting: Insights into the Provisional Approach

Peter Mortier[1,2], Matthieu De Beule[1,2], Patrick Segers[1], Pascal Verdonck[1], Benedict Verhegghe[1,2]

[1] bioMMeda, Institute Biomedical Technology (IBiTech), Ghent University, Gent, Belgium
[2] FEops bvba, Gent, Belgium

Background: Stenting coronary bifurcation lesions remains a challenge in interventional cardiology. The provisional side-branch stenting strategy is currently the gold standard and may involve a postdilation with one or two balloons to improve the side branch access. We studied the impact of several parameters of this procedure using advanced finite element simulations in order to improve the current understanding of this approach.

Methods: Four second generation DES were included in this study: Cypher Select, Endeavor, Taxus and Xience V. The stents were virtually implanted in the main branch of a bifurcation model, followed by the insertion of a balloon through the side of the stent into the side branch. This side branch balloon was for each stent inserted through two different cells (a proximal and a distal one), resulting in eight cases. The final strut deformations were qualitatively analysed.

Results: Inflating the side branch balloon through a proximal cell results in floating struts at the carina and in a limited scaffolding of the side branch ostium. In contrast, insertion and inflation through a more distal cell generally leads to less floating struts within the main branch and improves the strut protrusion into the side branch. The obtained results also clearly show the importance of selecting stents with an adequate cell size.

Conclusion: The occurrence of obstructing and floating struts seems unavoidable, but inflating the side branch balloon through a more distal cell seems the preferred strategy from mechanical point of view.