Comparison of overexpansion capabilities and thrombogenicity at the side branch ostia after implantation of four different drug eluting stents.

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Background

Interventions in bifurcation lesions often requires aggressive overexpansion of stent diameter in the setting of long tapering vessel segment. **Overhanging struts in front of the side branch (SB) ostium are thought to act as a focal point for thrombi formation and consequently possible stent thrombosis.**

Aim

This study aimed to evaluate the overexpansion capabilities and thrombogenicity at the SB ostia after implantation of four latest generation drug-eluting stents (DES) in an in-vitro bifurcation model.

Methods

Four clinically available modern DES were utilized: one bifurcation dedicated DES (Bioss LIM C) and three conventional DES (Ultimaster, Xience Sierra, Biomime). All devices were implanted in bifurcation models with proximal optimization ensuring expansion before perfusing with porcine blood. Optical coherence tomography (OCT), immunofluorescence (IF) and scanning electron microscope analysis were done to determine thrombogenicity and polymer coating integrity at the over-expanded part of the stents. Computational fluid dynamics (CFD) was performed to study the flow disruption.

Results

OCT (p = 0.113) and IF analysis (p = 0.007) demonstrated lowest thrombus area at SB ostia in bifurcation dedicated DES with favorable biomechanical properties compared to conventional DES. The bifurcated DES also resulted in reduced area of high shear rate and maximum shear rate in the CFD analysis.

Conclusions

This study demonstrated numerical differences in terms of mechanical properties and acute thrombogenicity at SB ostia between tested devices.

The bifurcation dedicated Bioss LIM C showed lower acute thrombogenicity when compared to conventional DES in the benchtop model.

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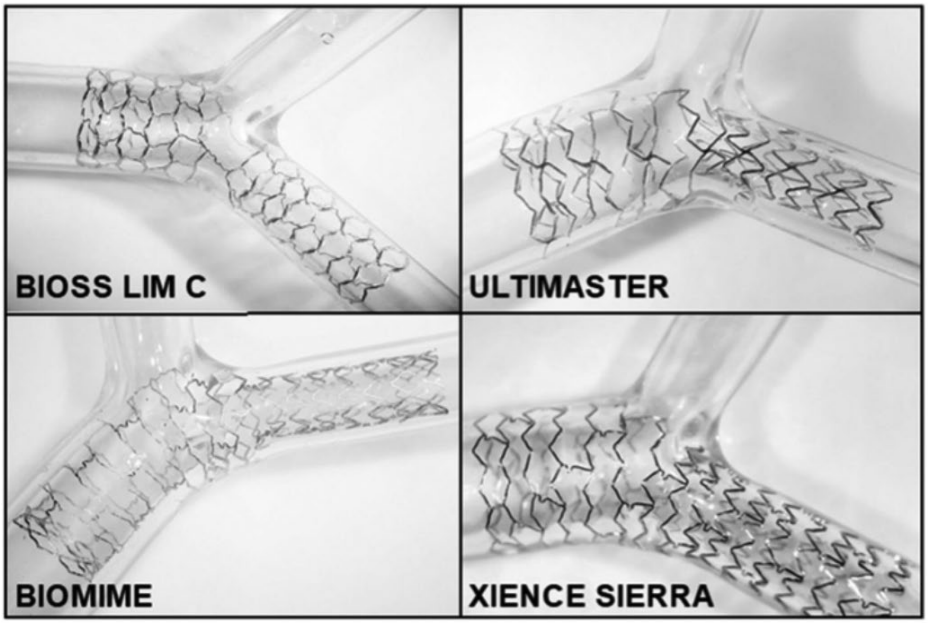
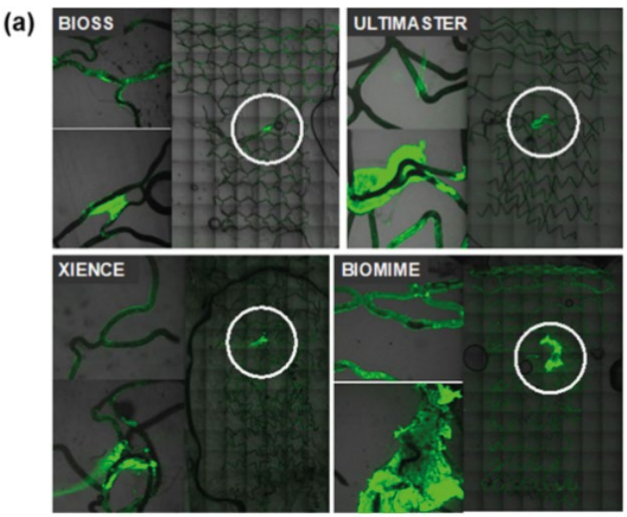


Figure 1. Optical images of stents deployed in bifurcation model.



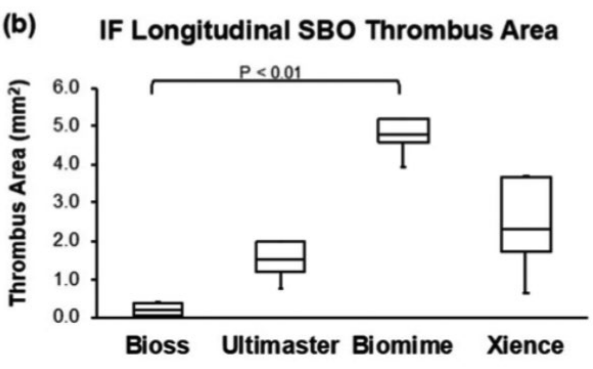


Figure 5. (a) Representative confocal images and (b) immunofluorescence (IF) quantification of thrombus formation on the stents at 60mins.