Evaluation of the physiologic characteristics of drug eluting stents at implantation and during follow-up

Evaluation of the Physiologic Characteristics of Drug-Eluting Stents at Implantation and During Follow-up

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Introduction

Drug-eluting stents have been introduced with the prospect of a considerable reduction of the restenosis rate after percutaneous coronary intervention (PCI). The restenosis rate after stent placement can be reduced from approximately 20% with bare metal stents (Bx Velocity™) to approximately 10% when using drug-eluting stents (Cypher™).

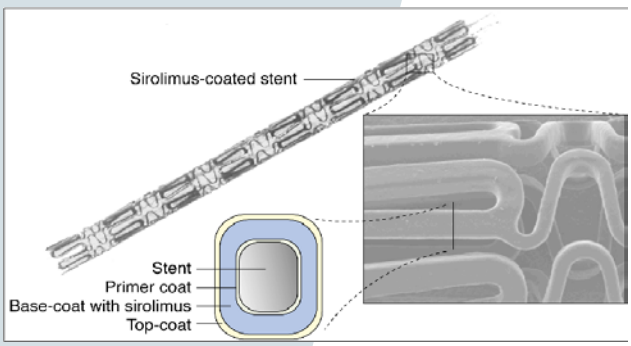

Figure 1: Representation of a drug-eluting stent. The cross-section schematically shows the stent-structure with the coating containing the drug.

The aim of this study was to investigate physiologic parameters like fractional flow reserve (FFR), hyperemic stent gradient (HSG), and shear stress at implantation and during six-month follow-up.

Methods

Twenty patients accepted for PCI of at least two coronary arteries with comparable vessel- and stenosis characteristics received one drug-eluting (Cypher) and one bare metal stent (Bx Velocity) of comparable length and diameter. Coronary pressure, FFR, and trans-stent gradients were measured just after stent implantation and at 6-month follow-up. Coronary wall shear stress was calculated from QCA, coronary flow velocity, and blood viscosity just after stent implantation and at 6-month follow-up.

Results

Just after stent implantation no differences were seen between the two stents. In contrast, after six months the FFR (table 1) as well as the HSG (table 2) were significant higher in de Cypher stent with respect to the Bx Velocity stent. Moreover, the diameter within the stent remained larger in the Cypher stent. Consequently the shear stress was more homogeneously distributed throughout the Cypher stent (fig.2).

Table 1: FFR just after stent implantation and at six- month follow-up.

FFR	Cypher	Bx Velocity	P-value
Just after implantation	0.90±0.06	0.88±0.07	P=0.525
6-month follow-up	0.91±0.05	0.83±0.10	P=0.014

Table 2: HSG just after stent implantation and at six-month follow-up.

HSG	Cypher	Bx Velocity	P-value
Just after implantation	0.97±0.02	0.96±0.04	P=0.152
6-month follow-up	0.99±0.01	0.91±0.09	P<0.01

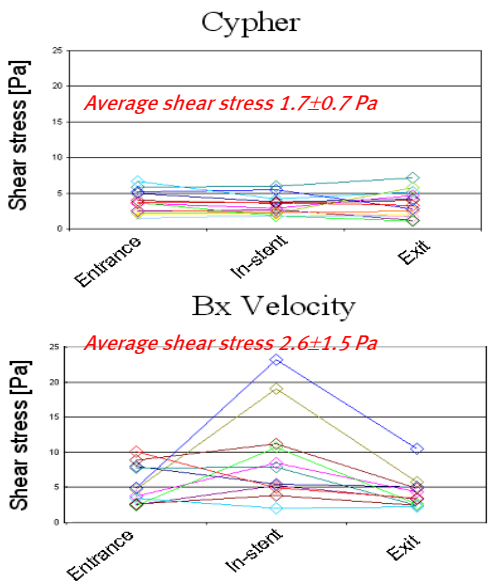

Figure 2: Shear stress calculated at three positions for both stents after six months. The averaged values for the shear stress differ significantly (P=0.034).

Conclusions

The drug-eluting Cypher stent shows significant better physiologic characteristics at six months in comparison to the bare metal Bx Velocity stent, respectively a higher FFR, higher HSG and a more homogeneous shear stress were found.