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Presentation Abstract

Session:	21-8-Implications of device/tissue interaction for Endovascular Prosthetic Design in cardiovascular diseases & Restenosis. Part I: Stents, DES and angioplasty balloons
Presentation:	Diagnosis of Coronary Artery Disease using Fluid Dynamic Principles
Location:	C
Presentation Time:	Friday, Jul 11, 2014, 3:36 PM - 3:54 PM

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Abstract: **Background:** Functional assessment of coronary lesion severity, during cardiac catheterization, is conducted using diagnostic parameters like fractional flow reserve (FFR; pressure derived) and coronary flow reserve (CFR; flow derived). However, the complex hemodynamics of stenosis might not be sufficiently explained by either pressure or flow alone, particularly in the case of intermediate stenosis. CDP (ratio of pressure drop across a stenosis to distal dynamic pressure), a non-dimensional index derived from fundamental fluid dynamic principles, based on a combination of intracoronary pressure and flow may improve the functional assessment of coronary lesion severity.
Methods: In a clinical trial, twenty-seven patients with suspected coronary artery disease were consented before cardiac catheterization. Simultaneous measurements of distal coronary arterial pressure and flow were performed using a dual sensor-tipped guidewire in these patients to evaluate hemodynamic parameters, CFR, FFR and CDP. The functional index CDP was correlated with both CFR and FFR. Further, in order to increase the sample-size for the analysis,we performed a meta-analysis of seven studies, retrieved from MEDLINE and PubMed, comparing the results of FFR and CFR of the same lesions. Two studies, including our clinical trial, reported functional measurements (pressure and flow) obtained in individual patients. Five studies reported 2D plots of FFR vs CFR. The FFR and CFR data were digitized and corresponding functional measurements were extracted using the reported mean values of hemodynamic data from each of the five studies. The receiver operating characteristic (ROC) curve was used to identify the optimal cut-off point of CDP, which corresponds to the clinically used cut-off values (FFR=0.80, FFR=0.75 and CFR=2.0).
Results: CDP correlated significantly with FFR (r=0.78, p<0.001) and had significant diagnostic efficiency (ROC-area under curve of 89%), specificity (83% and 85%) and sensitivity (81% and 76%) at FFR<0.8 and FFR<0.75, respectively. The corresponding cut-off value for CDP to detect FFR27.9, respectively.
Conclusions: CDP, a functional parameter based on both intracoronary pressure and flow measurements, has close agreement (area under ROC curve=89%) with FFR, the most frequently used method for evaluation of functional severity of coronary stenosis.

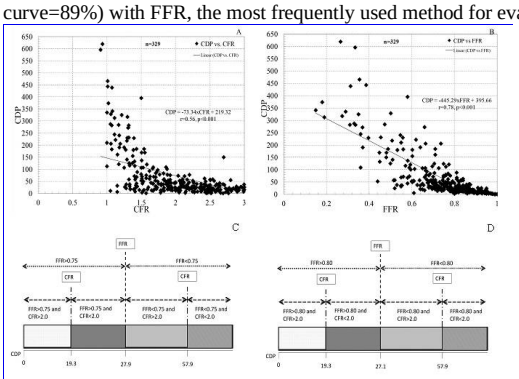

Figure: Correlation of CDP with CFR (A), FFR (B) and Schematic representation of CDP cut-off for different cutoffs of FFR and CFR (C&D)

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