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1007-174 The Effect of Microvascular Dysfunction on the Relationship Between Fractional Flow Reserve and Anatomic Stenosis Severity

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Objectives: Fractional flow reserve (FFR) had been applied as a specific functional indicator of stenosis severity and it showed an excellent correlation with anatomic stenosis severity, at least in patients with preserved microvascular function. However, to what extent the degree of microvascular dysfunction could affect the relationship between FFR and anatomic stenosis severity has not been clarified.
Methods: Thirty-four lesions of 33 patients (14 AMI related arteries; 19 non MI related arteries) were studied. Coronary stenting was done in 25 lesions. IVUS % area stenosis (IVUS-%AS), FFR, and coronary flow reserve (CFR) were measured .before and after PCI. Fifty-four studied lesion sites were divided into two groups according to the degree of microvascular dysfunction(Group 1, Post-stent CFR or CFR without PCI ≥2.5, n=38; Group 2, Post-stent CFR<2.5, n=18).
Results: There was no significant difference in IVUS-%AS between two groups (44±37 vs. 51±30, p=0.449). FFR was lower and CFR was higher in Group 1 than in Group 2 (0.80±0.18 vs. 0.89±0.07, p=0.044; 3.40±0.55 vs. 1.90±0.33, p<0.001, respectively). There were significant correlation between FFR and IVUS-%AS in Group 1 (r=0.88, p<0.001), and in Group 2 (r=0.69, p=0.024). However, the concordance between FFR and IVUS-%AS was 89.5% in Group 1 (sensitivity 90.1%, specificity 88.9%, κ=0.757, p<0.000) and 72.2% in Group 2 (sensitivity 16.7%, specificity 100%, κ=0.211, p=0.333), on the cut-off values of 0.75 and 75%, respectively.
Conclusion: Microvascular dysfunction significantly affects the relationship between FFR and anatomic stenosis severity. FFR significantly underestimates the anatomic stenosis severity in cases of microvascular dysfunction. This data suggested that microvascular vasodilatory reserve at least greater than 2.5 is required for the excellent correlation between FFR and anatomic stenosis severity.

1007-175 Fixing Chronic Stent Underexpansion Is Associated With a Low Rate of Recurrence: An Intravascular Ultrasound Analysis

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Background: Previous studies have shown that chronic stent underexpansion is a common intravascular ultrasound (IVUS) finding in in-stent restenosis (ISR) lesions. In particular, almost 40% of ISR lesions have a minimum stent area <6.0mm^2 and half of these have a minimum stent area <5.0mm^2. We hypothesized that "fixing" this stent underexpansion would be associated with a low rate of recurrence.
Methods and Results: Seventy-three patients with ISR met the following criteria: pre- and post-intervention IVUS imaging with a pre-intervention IVUS minimum stent area <6.0mm^2, no brachytherapy, and one year follow-up. 32% of patients were diabetic; and 45/73 (62%) of lesions were classified as diffuse or proliferative ISR. IVUS results are shown in the table. The absolute increase in stent area averaged 2.2±2.3mm^2. Post-intervention stent expansion (stent area/reference lumen area) increased to 1.13±0.27 (p=0.0014). Importantly, at one year, the recurrence rate was only 13.7% (10/73) and was not different in diffuse/proliferative vs focal ISR (p=0.5).
Conclusion: Additional stent expansion is possible even in chronically underexpanded stents. When recognized (by IVUS) and corrected, chronic stent underexpansion results in a low recurrence rate (13.7% at one year) even in diffuse or proliferative ISR. This supports routine IVUS evaluation when patients present with ISR.

	Pre-intervention	Post-intervention	p
Reference lumen area (mm^2)	5.8±2.1	6.4±1.9	0.3
Minimum stent area (mm^2)	5.0±0.7	7.3±2.2	<0.0001
Minimum lumen area (mm^2)	1.9±0.5	5.4±2.1	<0.0001
Intimal hyperplasia (mm^2)	3.2±0.6	1.9±1.3	<0.0001

1007-176 Mechanisms of Abrupt Vessel Closure After Coronary Angioplasty: Results of a Systematic Intravascular Ultrasound Study

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Background: The factors leading to abrupt closure after percutaneous coronary angioplasty (PCI) have not been well established. We used intravascular ultrasound (IVUS) to determine the pre- and post-PCI characteristics involved in abrupt closure.
Methods: We analyzed 10,723 consecutive pts without acute myocardial infarction who were treated with PCI and underwent IVUS imaging during the intervention. 46 (0.4%) had angiographically documented abrupt closure <1 week post-PCI (median time to abrupt closure=24hrs). 30 arteries were treated with stent at the time of procedure.
Results: In stented arteries, lumen reference and minimal stent areas were 9.6 ± 3.2 mm^2 and 6.4 ± 2.6 mm^2, respectively. In non-stented arteries, reference lumen area was 10.8 ± 3.3 mm^2 and final minimal lumen area was 6.8 ± 2.7 mm^2. Overall, post-IVUS identified at least one cause for abrupt closure in 82% of patients; the cause was multiple in 33%. Causes included dissection 13% (all distal), thrombus 13%, tissue protrusion within the stent struts with compromised lumen 8%, and plaque tear post-PCI 3%. 94% of patients with one of these abnormal morphologic findings also had reduced lumen dimensions post-PCI (final lumen <80% reference lumen area). Stent expansion according to the MUSIC criteria was adequate in only 20% of the arteries. Pre-PCI IVUS showed a thrombus in only 5% (not documented any longer in post-PCI IVUS after stenting).
Conclusions: Abrupt closure is infrequently related to the pre-intervention lesion characteristics. Inadequate post-procedure lumen dimensions -- alone or in combination with other procedurally-related abnormal lesion morphologies (dissection, thrombus, tissue prolapse) -- contribute to this phenomenon.

1007-177 Volumetric Analysis of LAD-Diagonal and LCX-Obtuse Marginal Coronary Bifurcations: An Intravascular Ultrasound Study

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Background: Vessel bifurcations are prone to early atherosclerotic plaque accumulation. In order to better understand plaque distribution at bifurcation lesions we systematically analyzed LAD-Diag and LCX-OM bifurcations using intravascular ultrasound.
Methods: We analyzed plaque distribution in 49 LAD-Diag and 20 LCX-OM bifurcations with <50% angiographic stenosis. Planimetry of the lumen and EEM was performed at 1 mm intervals in the segments 5 mm proximal and distal to the bifurcation. EEM, lumen and plaque volume and % plaque burden (plaque volume/EEM volume) were calculated. In each of the 12 images, plaque thickness was measured at 4 different points relative to the origin of the branch: plaque thickness at 0°, 90°, 180° and 270°, clockwise from the side branch.
Results: % plaque burden was similar in proximal and distal segments. However, plaque volume, lumen volume and EEM volume were significantly larger proximal to bifurcation (table). Maximal plaque thickness was observed opposite to the branch equally in proximal and distal segments. However, plaque thickness at 90°, 270° and 360° was smaller distally.

	Vessel Volume(mm^3)	Lumen Volume(mm^3)	Plaque Volume(mm^3)	% plaque burden	Plaque Thickness at 0° (mm)	Plaque Thickness at 90° (mm)	Plaque Thickness at 180° (mm)	Plaque Thickness at 270° (mm)
Proximal	100.2±30	54.8±17	45.4±19	0.45±0.19	0.44±0.33	0.57±0.42	0.69±0.40	0.58±0.35
Distal	77.3±29	43.2±17	34.2±18	0.42±0.26	0.30±0.21	0.50±0.43	0.71±0.40	0.50±0.34
p	0.0001	<0.0001	0.0005	NS	<0.0001	0.025	NS	0.0015

Conclusion: 1) Although % plaque burden was similar, proximal segments have larger plaque volume than distal segments. 2) Plaque volume is asymmetrically located opposite to the flow divider, especially in distal segment. These angiographically unrecognized plaque distributions should be considered during PCI of more advanced bifurcation lesions.

1007-197 Impact of Diabetes on Coronary Remodeling in Patients With Acute Coronary Syndromes: An Intravascular Ultrasound Study

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Background: Intravascular ultrasound (IVUS) studies have shown that positive remodeling predominates in lesions responsible for acute coronary syndromes (ACS), whereas negative remodeling is more prevalent in diabetic pts and in stable angina pts. **Objectives:** To use IVUS to investigate the association between remodeling of the culprit lesion, ACS, and diabetes. **Methods:** We performed pre-intervention IVUS on 927 pts and divided the pts into 4 groups according to clinical presentation and presence of diabetes: Stable angina and diabetes (n=88), stable angina/no diabetes (n=187), unstable angina and diabetes (n=183) and unstable angina/no diabetes (n=469). Vessels were classified as positive or negative remodeling if the lesion vessel CSA was larger or smaller, respectively, than the average of the proximal and distal reference vessel areas.
Results: Overall, positive remodeling was more prevalent in patients with ACS compared to stable pts (43% vs. 21%. p<0.001), see table.

	Stable DM	Stable/ No DM	Unstable DM	Unstable No DM	p-value ANOVA
Reference vessel CSA (mm^2)	12.9±4.0	13.5±4.4	14.3±5.6	14.1±4.9	0.23
Lesion vessel CSA (mm^2)	12.2±4.6	11.2±4.3	12.1±5.0	12.2±4.8	0.24
Lesion lumen CSA (mm^2)	2.4±0.9	2.3±1.0	2.3±0.9	2.5±1.2	0.04
+ Remodeling	19.6%	22.3%	32%	48%	<0.001
- Remodeling	80.4%	77.7%	68%	52%	<0.001

Conclusions: Diabetes modulates the relationship between remodeling and ACS. Diabetes decreases the frequency of positive remodeling in ACS pts while it increases the frequency of negative remodeling in stable angina. These data suggest a unique patho-