CRT-100.03

Appropriateness of Use of Bivalirudin in Patients Undergoing Percutaneous Coronary Catheterization Using Crusade Bleeding Score: Single Center Study

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BACKGROUND Percutaneous coronary intervention (PCI) is a conventional procedure for the management of stable coronary artery disease. The goals of this study were to establish periprocedural bleeding risk before elective PCI and to observe consequent changes in anticoagulant after implementation of use of a bleeding risk calculator. The secondary outcome included average total cost per case in which bivalirudin was used compared to use of heparin.

METHODS This pilot retrospective study was approved by St. Vincent Charity Medical Center Institutional review board. The cohort consisted of 100 patients who underwent PCI procedures between October 2014 and October 2015, whose bleeding risk was derived by using CRUSADE bleeding risk calculator to determine the appropriate use of Angiomax in them. The CRUSADE Bleeding Score was developed using data from over 89,000 "real-world" patients enrolled in the CRUSADE Quality Improvement Initiative that presented with NSTEMI. A patient's CRUSADE Bleeding Score equals the sum of the weighted scores for the independent predictors (range 1-100 points).The CRUSADE Bleeding Score considers baseline patient characteristics (female sex, history of diabetes, peripheral vascular disease), admission clinical variables (heart rate, systolic blood pressure, signs of CHF), and admission laboratory values (hematocrit, calculated creatinine clearance) to estimate the patient's likelihood of having an in-hospital major bleed event.

RESULTS The CRUSADE bleeding risk calculator distinguished patients in the pilot cohort as high risk, moderate risk and low risk for bleeding after a PCI procedure. Among 100 patients who underwent PCI, 23 were high, 26 moderate, 27 low, 24 very low risk. 96 out of 100 patients received bivalirudin irrespective of their bleeding risk score. Out of 4 patients who received heparin 2 were low risk, 1 was very low risk and 1 was moderate risk.

CONCLUSION A simple bleeding risk calculator can substantially reduce overall bivalirudin use by specifically decreasing its use among patients at low bleeding risk while maintaining its use among patients at high bleeding risk. Studies have proven that incidence of bleeding complications remained unchanged despite decreasing bivalirudin use among patients undergoing elective PCI who were at low risk of bleeding. The cost of bivalirudin is 20 times more than heparin and its inappropriate use would be burden for patient.

CRT-100.04

Impact of Ambient Air Pollution on Coronary Artery Spasm

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BACKGROUND Ambient air pollution is well-known to be a serious risk factor for cardiovascular diseases, stroke, and death. However, the association between air pollutants (AP) exposure and coronary artery spasm (CAS) by acetylcholine (Ach) provocation test is not well elucidated yet.

METHODS A total of 5,822 consecutive patients without significant coronary artery disease (CAD) who underwent Ach provocation test between November 2004 and May 2014 were enrolled for this study. Significant CAS was defined as > 70% of narrowing by incremental intracoronary injection of 20, 50 and 100 μg. APs are largely divided into two types: Particulate matter with aerodynamic diameter of less than or equal to 10 μm in size (PM_{10}) and gaseous pollutants such as nitrogen dioxide (NO_2), and sulfur dioxide (SO_2), carbon monoxide (CO) and ozone (O_3).

RESULTS Among various APs, PM_{10} was only strongly correlated to CAS with Lag_{01}, Lag_{12} and Lag_{012}. Patients exposed to PM_{10} was divided into four quartile groups by four different ranges of concentration from lowest PM_{10} concentration group (Q1) to highest PM_{10} concentration group (Q4) before being analyzed. Group Q4 showed higher incidence of CAS than group Q1, and the risk of CAS increased 24 % (95% CI: 7 % to 44%, p=0.004) in Group Q1 than Group Q4. After baseline adjustment analysis, the risk of CAS increased 26 % (95% CI: 8 % to 47 %, p=0.004) in Group Q1 than Group Q4.

CONCLUSION Among various APs, only PM_{10} is significantly related with CAS, and it is a strong risk factor for CAS. Our findings indicate that exposure to AP such as PM_{10} is associated with endothelial dysfunction which may cause variant angina and other cardiovascular disease.

Table. Angiographic Clinical Outcomes at Acetylcholine Provocation Test

Variables, N (%)	1 Quartile (n=1464)	2 Quartile (n=1521)	3 Quartile (n=1415)	4 Quartile (n=1422)	P value
Angiographic and Clinical Outcomes at Acetylcholine Provocation Test					
CAS positive	817 (55.8)	870 (57.2)	807 (57.0)	869 (61.1)	0.025
Spontaneous spasm,	291 (19.9)	314 (20.6)	265 (18.7)	321 (22.6)	0.077
EKG change	63 (4.3)	64 (4.2)	67 (4.7)	67 (4.7)	0.858
ST-segment elevation	8 (0.5)	19 (1.2)	25 (1.8)	25 (1.8)	0.012
ST-segment depression	30 (2.0)	20 (1.3)	17 (1.2)	26 (1.8)	0.206
T-inversion	14 (1.0)	15 (1.0)	14 (1.0)	11 (0.8)	0.920
Atrial fibrillation	13 (0.9)	12 (0.8)	15 (1.1)	8 (0.6)	0.522
Chest pain	654 (44.7)	703 (46.2)	612 (43.3)	660 (46.4)	0.282

A total of 5,822 eligible patients were divided on quartile groups by a lag same day to 2 day before for PM_{10} (i.e: Lag_{012} of PM_{10}): Q1 (n=1464; PM_{10} < 34), Q2 (n=1521; 34≤ PM_{10}< 48), Q3 (n=1415; 48≤ PM_{10}< 63) and Q4 (n=1422; PM_{10} ≥ 63).

CRT-100.05

Tissue Characteristics of Culprit Coronary Lesions in Acute Coronary Syndrome and Target Coronary Lesions in Stable Angina Pectoris Using Virtual Histology and Intravascular Ultrasound

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OBJECTIVE Coronary plaque composition cannot be assessed accurately using gray-scale intravascular ultrasound (IVUS). Using virtual histology IVUS (VH-IVUS), a comparison of coronary plaque composition between acute coronary syndromes (ACS) and stable angina pectoris (SAP) was performed.

METHODS Pre-intervention IVUS of de novo culprit and target lesions was performed in 46 patients (20 with ACS and 26 with SAP). Using VH-IVUS, plaque was characterized as fibrotic, fibro-fatty, dense calcium, and necrotic core. VH-IVUS-derived thin-cap fibro-atheroma (VH-TCFA) was defined as necrotic core >10% of plaque area without overlying fibrous tissue in a plaque burden >40%. Lesions were classified into 3 groups: ruptured, VH-TCFA, and non-VH-TCFA plaque. Unstable lesions were defined as either VH-TCFA or ruptured plaque.

RESULTS Compared with patients with SAP, those with ACS had significantly more unstable lesions (89% vs 62%, p <0.001). Planar VH-IVUS analysis at the minimum luminal site and at the largest necrotic core site and volumetric analysis over a 10-mm-long segment centered at the minimum luminal site showed that the percentage of necrotic core was significantly greater and that the percentage of fibro-fatty plaque was significantly smaller in patients with ACS. The percentages of fibrotic and fibro-fatty plaque areas and volumes were smaller, and the percentages of necrotic core areas and volumes were larger in VH-TCFAs compared with non-TCFAs. Ruptured plaques in VH-IVUS analyses showed intermediate findings between VH-TCFAs and non-VH-TCFAs.

CONCLUSION Culprit lesions in patients with ACS were more unstable and had greater amounts of necrotic core and smaller amounts of fibro-fatty plaque compared with target lesions in patients with SAP.

CRT-100.06

Differences in Quantitative Coronary Angiographic (QCA) Characteristics of Coronary Artery Disease and Clinical Outcomes Between Statin Pre-treated and Statin-Naïve Human Immunodeficiency Virus (HIV) Patients Undergoing Percutaneous Coronary Intervention (PCI)

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BACKGROUND Whereas statins are well-known to contribute to atheromatic plaque stability and regression of atherosclerosis burden, possible interactions with anti-retroviral therapy have led to sub-prescription in this cohort. However, exactly how statins affect the angiographic phenotype, coronary lesion characteristics and clinical outcomes in HIV patients undergoing PCI has not yet been investigated.

METHODS This is a retrospective, single-center study comparing pre-treated with statin to statin-naïve HIV patients who underwent PCI between 2003-2011. Quantitative coronary angiography (QCA) was performed for all treated lesions at baseline and following PCI in both groups. 1- Year clinical outcomes post-PCI were also analyzed.

RESULTS Statin pre-treated patients (n=47, 51%) had more frequently hyperlipidemia (95% vs. 50%, p<0.001), had higher weight (86 kg vs. 77kg, p=0.04), and presented more frequently with acute coronary syndrome (57.4% vs. 37%, p=0.04) as compared to those without pretreatment. Both groups had similar grade of stenosis and extent of CAD as measured by SYNTAX score; however statin pre-treated patients were more likely to have moderate/heavy calcified lesions and treated with drug eluting stents as compared to statin naïve patients (table 1). After multivariable adjustment statin pre-treatment was associated with decreased rates of major adverse cardiac event (MACE) at 1 year post-PCI (HR 0.29, 95% CI 0.08-1.02, p=0.05).

CONCLUSION While statin pre-treated HIV patients were more likely to present with ACS and had worse cardiovascular risk profile, angiographic analysis reveals no significant differences in CAD burden and lesion characteristics. Statin use was associated with more favorable clinical outcomes suggesting the beneficial effects of statins in atherosclerosis progression in HIV patients.

Table 1. Angiographic lesion characteristics in statin pre-treated and statin naive HIV patients undergoing PCI

	Statin +	Statin -	p-value
Per patient	**N=47**	**N=46**	
Number of disease vessels (1-vessel)	32(68%)	28(61%)	0.47
Syntax Score	12.6 ± 8.8	11.3 ± 6.0	0.44
Per Lesion	**N=66**	**N=75**	
Lesion length (mm)	18.5 ± 12.1	15.7 ± 9.7	0.12
Calcification (No/Mild)	33 (50%)	51 (68%)	0.04
MLD	0.89 ± 0.51	0.87 ± 0.50	0.85
Diameter stenosis (%)	67.1 ± 14.7	67.2 ± 15.9	0.96
TIMI flow at baseline (0 or 1)	8 (12.3%)	13 (17.3%)	0.55
1st or 2nd generation DES	46 (69.7%)	45 (60%)	0.04

MLD= Minimal lumen Diameter, TIMI= Thrombolysis In Myocardial Infarction, DES= Drug Eluting Stent. Data are expressed as mean ±SD, median (interquartile range) or as number (percentage).

CRT-100.07

ABSTRACT WITHDRAWN

CRT-100.08

Coronary Arterial Remodeling Is Associated With Coronary Plaque Components: Virtual Histology-Intravascular Ultrasound Analysis

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OBJECTIVE We used virtual histology-intravascular ultrasound (VH-IVUS) to evaluate the relation between coronary artery remodeling pattern and plaque components in 46 patients.

METHODS We divided the patients into two groups according to the remodeling pattern as positive remodeling (PR, remodeling index>1.05) (n=18) and intermediate remodeling (IR, remodeling index≤1.05 and ≥0.95)/negative remodeling (NR, remodeling indexb0.95) (n=38). VH-IVUS analysis classified the color-coded tissue into four major components: green (fibrotic, FT); yellow-green (fibro-fatty); white (dense calcium); and red (necrotic core, NC). Thin-cap fibro-atheroma (TCFA) was defined as focal, NC-rich (≥10% of the cross-sectional area) plaques being in contact with the lumen in a plaque burden≥40%.

RESULTS At the minimum lumen site, PR group had greater plaque plus media area (10.8±4.9 vs. 7.9± 3.8 mm2, pb0.001) and greater %NC area (19.7±12.3 vs. 16.2±11.6%, pb0.001) and smaller %FT area (52.0±14.5 vs. 55.4±14.6%, p=0.037) compared with IR/NR group. PR group had greater plaque volume (190±150 vs. 130±130 mm3, pb0.001) and greater %NC volume (18.1±9.6 vs. 15.6±9.2%, p=0.001) and smaller %FT volume (49.3±11.7 vs. 58.6±11.0%, p=0.009) compared with IR/NR group. PR group had more TCFA compared with IR/NR group (21% vs. 13%, p=0.006). Similar findings about plaque components were observed in terms of greater %NC volume and smaller %FT volume in PR group compared with IR/ NR group in patients with both acute coronary syndrome and stable angina.

CONCLUSION VH-IVUS analysis demonstrates that PR was associated with more vulnerable plaque components compared with IR/NR regardless of their clinical presentation.

CRT-100.09

The Impact of *CYP2C19, ABCB1* Genes Polymorphisms and CYP3A4 Isoenzyme Activity on the Incidence of Stent Implantation Complications for Patients With an Acute Coronary Syndrome

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BACKGROUND *CYP2C19, ABCB1* loss-of-function variant carriers are subject to diminished platelet response to clopidogrel. This may result in complications associated with suboptimal blood-thinning levels, such as stent thrombosis as well as other major adverse cardiovascular events. The purpose of this study was to assess the impact of *CYP2C19, ABCB1* genes polymorphisms and CYP3A4 isoenzyme activity on the incidence of stent implantation complications for patients with an acute coronary syndrome.

METHODS Seventy-six patients (median age 63, range 37 to 91 years) with an acute coronary syndrome who underwent percutaneous coronary intervention and had either drug-eluting stent (n=30) or bare-metal stent (n=46) implanted, were screened for *CYP2C19, ABCB1* genes polymorphisms: *CYP2C19*2, CYP2C19*3, CYP2C19*17, ABCB1 3435 CT, ABCB1 3435 TT*. CYP3A4 isoenzyme activity was determined by urine cortisol and 6-beta-hydroxycortisol levels. $P2Y_{12}$ reaction unit levels utilizing VerifyNow $P2Y_{12}$ assay (Accumetrics, San Diego, CA) were measured. Such stent implantation complications as stent thrombosis (n=2) and restenosis (n=1) were observed among drug-eluting stent recipients.

RESULTS Low mean 6-beta-hydroxycortisol / cortisol ratio is indicative of impaired CYP3A4 activity and was associated with higher risk of thrombosis (β coefficient=0.022, SE 0.009, p=0.021 in the linear regression model). The increase in the length of the implanted stent was associated with higher risk of restenosis (β coefficient=0.006, SE=0.002, p=0.001 in the linear regression model). The presence of the *CYP2C19*2* polymorphism did not affect the incidence of stent thrombosis (β coefficient=-1.626, SE=1.449, p=0.262 in the logistic regression model), nor did the *CYP2C19*17* (β coefficient=-0.907, SE=1.438, p=0.528 in the logistic regression model) and *ABCB1 3435* polymorphisms (β coefficient=1.270, SE=1.442, p=0.378 in the logistic regression model).

CONCLUSION Although it is accepted that *CYP2C19,* and *ABCB1* loss-of-function variant carriers may need clopidogrel dose adjustment or drug change, we did not find evidence that the presence of *CYP2C19*2, CYP2C19*17, ABCB1 3435 CT, ABCB1 3435 TT* polymorphisms may jeopardize the safety of stent implantation in patients with an acute coronary syndrome. Patients with low CYP3A4 isoenzyme activity may have increased risk of stent thrombosis and this matter needs further investigation.