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CRT-100.04 Delaying Reperfusion Plus LV Unloading Reduces Infarct Size: A Per-Protocol-Analysis of the STEMI_DTU Pilot Study

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BACKGROUND When patients presented with acute coronary syndrome (ACS), they could have developed new severe lesions or their pre-existing lesions progressed to higher severity within a short period of time. For patients >80 with ACS, what is the pathological mechanism causing ischemia? In the past 5 years, our research team applied the practice of hydraulic to coronary flow in which laminar flow was considered to preserve equipment life while turbulent flow damaged the inner surface of pipes and components of pumps. Could we use coronary flow dynamic to explain the mechanism causing ACS in patients >80?

METHODS Patients aged >80 with ACS were enrolled and underwent a new dynamic angiogram. At first, contrast was injected until the coronary arteries were completely opacified. As the injection stopped, the blood in white color moved in and displaced the contrast in black color. The coronary flows in white color were identified, recorded at 15 images per second, saved on power point slides so each image could be inspected at slow speed suitable for human visual inspection. At the same time, Machine Learning algorithms program had 2 models built on Python. Model 1 was based on U-net and Densenet-121 for vessel segmentation. Model 2 was used for classification and movement of flow. Model 2 was trained based on the convolutional neural network. The main measurements by human reviewers or machine learning programs were the laminar or turbulent flow, the central or peripheral flow, the calculation of the arterial phase (time of beginning blood flow at the coronary ostium until all contrast disappeared from distal vasculature in millisecond [msec]).

RESULTS 30 patients aged >80-95 were enrolled. The main abnormalities were (1) 80% had slow flow with prolonged arterial phase, (>36msec) (2) 90% had thick peripheral layers at the mid and beginning of distal segment due to friction with calcified wall, (3) Only 10% had severe lesions. Slow flow as evidenced by prolonged arterial phase caused ischemia by slow renewal of high oxygen blood (less new blood arriving to distal myocardium per minute). The thick peripheral layers prevented the intimal cells to absorb oxygen directly from the blood aggravating the aging process of the intima however calcified wall prevented the development or growth of the soft cover of a plaque so not many severe lesions were developed.

CONCLUSION In patients >80 with ACS, the main abnormalities were slow flow with prolonged arterial phase and thick peripheral layers. Very few severe lesions. Larger studies are needed to confirm the above findings.

CRT-101.02

Mortality and Cost by Delirium and Frailty in STEMI and PCI: Machine Learning and Propensity Score Cardio-Oncology Nationally Representative Analysis

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BACKGROUND The prevalence, co-prevalence, and impact on mortality and cost of delirium and frailty are unknown in STEMI and PCI, despite the aging global population and growing burden of cardio-oncology disease.

METHODS This is the first known nationally representative analysis (including with machine learning and propensity score analysis) of the above relationships. It utilized Machine Learning-augmented modified Propensity Score multivariable regression (ML-PSr) and the National Inpatient Sample spanning over 4,400 hospitals in the United States.

RESULTS Of the 90,869,382 adult hospitalizations from 2016-2018, 862,710 (0.95%) had STEMI and age >=65 years old, of whom 202,815 (23.51%) received PCI, and of whom 555 (0.27%) had frailty and 30 (0.01%) had both frailty and delirium. In STEMI and at least 65 years old, there was a co-prevalence of 7.12% of frailty and delirium, while PCI was significantly less likely for frailty (13.17% versus 23.56%) and much less likely for delirium (5.37% versus 24.99%) (both p<0.001). In ML-PS multivariable regression controlling for clinical confounders, delirium significantly reduced the odds of PCI being performed (OR 0.40, 95%CI 0.35-0.47, p<0.001) but frailty and its interaction with delirium did not. None of the above three predictors significantly increased post-PCI inpatient mortality. These relationships held when stratified by the presence and absence of active cancer. Additionally, when adjusting for length of stay in PCI, frailty and its interaction with delirium did not significantly increase cost but delirium did ($14,342.60, 95% CI 2,386.95-26,298.26, p=0.019).

CONCLUSIONS This multi-year, multi-center retrospective cohort analysis suggests older patients with delirium but not frailty are less likely to receive PCI despite comparable clinical severity and ultimate mortality odds compared to non-delirium, regardless of the presence or absence of cancer.

CRT-101.10

Outcomes of Underlying Infiltrative Cardiomyopathy in Percutaneous Coronary Intervention

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BACKGROUND Evidence on the prognosis of infiltrative cardiomyopathy in patients undergoing percutaneous coronary intervention (PCI) has not been well established. Our objective was to assess the prevalence of infiltrative cardiomyopathy including amyloidosis, sarcoidosis and hemochromatosis in PCI patients and its effect on mortality.

METHODS National Inpatient Sample 2016-2019 was used to conduct a retrospective analysis by identifying a cohort of patients who underwent PCI with infiltrative cardiomyopathy using respective ICD-10 codes. Primary outcome was the effect of infiltrative cardiomyopathy on mortality in patients undergoing PCI. Secondary outcomes were the independent predictors of mortality. Multivariate logistic regression model was used for analysis.

RESULTS 1.93 million patients were hospitalized for undergoing PCI, out of which 6270 patients had infiltrative cardiomyopathy (prevalence 0.33%). Subgroup analysis showed that 710 patients had underlying amyloidosis (prevalence 0.04%), 4300 patients had sarcoidosis (prevalence 0.23%) and 1280 patients had hemochromatosis (prevalence 0.07%). Mean age of patients undergoing PCI with infiltrative cardiomyopathy was 61 years, 54% were females and 53.5% were white. Patients undergoing PCI were predominantly males (67%) but patient with infiltrative cardiomyopathy who underwent PCI were predominantly females (54%). Underlying amyloidosis was associated with two fold increased odds of mortality in patients undergoing PCI (OR 2.13, 95% CI 1.08-4.23, p=0.029). While sarcoidosis (OR 1.11, 95% CI 0.73-1.7, p=0.6) and hemochromatosis (OR 0.79, 95% CI 0.32-1.92, p=0.6) were not significantly associated with mortality in patients undergoing PCI. The independent predictors of mortality in patients undergoing PCI with infiltrative cardiomyopathy are arrhythmias (OR 2.59, OR 1.14-5.9, p=0.02), cardiac arrest (OR 10.3, CI 3.8-27.6, p=0.00), pulmonary embolism (OR 5.8, CI 1.06-32.4, p=0.04), kidney disease (OR 4.5, CI 1.99-10.3, p=0.00) and liver disease OR 3.5, CI 1.34-9.1, p=0.01).

CONCLUSION Prevalence of infiltrative cardiomyopathy in patients undergoing PCI is 0.33%. Amyloidosis is associated with significantly increased odds of mortality in patients undergoing PCI while sarcoidosis and hemochromatosis are not significantly associated with mortality. Arrhythmias, cardiac arrest, pulmonary embolism, kidney and liver disease are independently associated with increased mortality in infiltrative cardiomyopathy patients undergoing PCI.

ACUTE MYOCARDIAL INFARCTION

CRT-100.04

Delaying Reperfusion Plus LV Unloading Reduces Infarct Size: A Per-Protocol-Analysis of the STEMI_DTU Pilot Study

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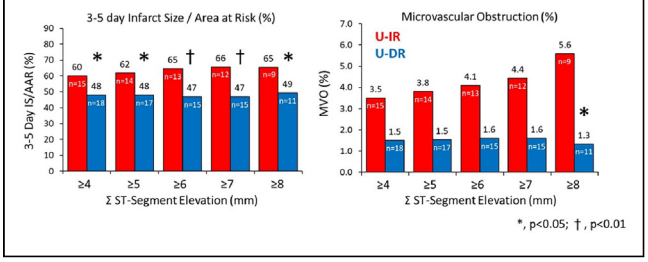
BACKGROUND Myocardial infarct size (IS) and microvascular obstruction (MVO) are well-established prognostic markers in STEMI. The STEMI-DTU pilot trial was the first exploratory study to identify that LV unloading and delayed reperfusion was feasible. We now report new findings in patients from per-protocol cohort on the basis of magnitude of sum of precordial ST-segment elevation.

METHOD In a multicenter, prospective, randomized safety and feasibility trial, 50 patients with anterior STEMI to LV unloading using Impella CP were assigned into two different arms including immediate reperfusion (U-IR) versus delayed reperfusion after 30 minutes of unloading (U-DR). Cardiac magnetic resonance (CMR) imaging assessed infarct size normalized to the area at risk (IS/AAR) 3-5 days after PCI. Patients without CMR at 3-5 days, without PCI of a culprit LAD lesion and without STEMI were not per-protocol and thus excluded from this analysis.

RESULTS 32 patients meeting all inclusion and exclusion criteria (U-IR,n=15; U-DR,n=17) were included in our analysis. Despite longer symptom-to-balloon times in the U-DR arm, IS/AAR was significantly lower with 30 minutes of delay to reperfusion in the presence of active LV unloading (47±16% vs 60±15%, p=0.02) and remained lower irrespective of the magnitude of precordial ΣSTE (Figure 1). MVO was not significantly different between groups (1.5±2.8% vs 3.5±4.8%,p=0.15), but significantly lower in the U-DR arm among patients with precordial ΣSTE≥8mm (1.5±2.5% vs 5.6±5.3%, p=0.04).

CONCLUSION This analysis supports the paradigm-changing concept that when treated per protocol, 30 minutes of delay to reperfusion with active LV unloading may reduce infarct size irrespective of precordial STE magnitude. Ongoing STEMI-DTU Pivotal trial will provide us further information on these findings.

Figure 1



CRT-100.1

Prognostic Implication of Hemoglobin Reduction and Bleeding Status After Percutaneous Coronary Intervention in Patients Hospitalized With Acute Coronary Syndromes

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OBJECTIVE This study aimed to determine whether a reduction in hemoglobin (Hgb) from pre- to post-percutaneous coronary intervention (PCI; with or without evidence of clinical bleeding) is a correlate of in-hospital mortality for patients presenting with the acute coronary syndrome (ACS) who underwent primary PCI.

METHODS The study cohort included 3316 consecutive patients with ACS who underwent PCI. These patients were divided into three specific categories: 1) Hemoglobin reduction - No Bleed (n=112); 2) Hemoglobin reduction - Overt Bleed (n=48); and 3) No Hemoglobin reduction - No Bleed (n=3156). Hgb reduction is defined as the difference between baseline and lowest Hgb values. Thresholds of 3-5 g/dl were used to classify Hgb reduction as overt bleed. The primary outcome of the study was in-hospital mortality. Next, the logistic regression method was used to examine the relationship between the primary outcome and Hgb reduction pre- and post-PCI with or without bleeding.

RESULTS Of the 3316 consecutive patients with ACS who underwent PCI, 2286 (70%) were male. In crude comparison analysis, the no Hgb reduction-no bleed group started with a lower pre-procedure Hgb level of 12.94 ± 2.07 g/dl, while the Hgb reduction-overt bleed patients were older, diabetic, had higher BMI, higher utilization of femoral access, higher gastrointestinal bleed rate, more warfarin and clopidogrel intake and manifested with a higher mortality rate (16.7%). In adjusted logistic regression, the Hgb reduction-no bleed and Hgb reduction-overt bleed groups in comparison with the No Hgb reduction-No bleed group both significantly predicted in-hospital mortality.

CONCLUSION This study demonstrated that in patients presenting with ACS post-PCI, Hgb reduction with and without overt bleeding were independently associated with in-hospital mortality. Special care should be exercised when Hgb reduction is detected.

Table. Predictor of In-hospital Outcome by Hemoglobin and bleeding Status

	Hemoglobin Drop-No Bleed*			Hemoglobin Drop-Overt Bleed*		
	OR	95% CI	*P*-value	OR	95% CI	*P*-value
Length of Hospital Stay >1 day	2.07	0.25-16.91	0.496	0.77	0.08-7.06	0.820
Death	10.96	2.84-42.34	**0.0005**	22.28	4.34-114.24	**0.0002**

* Versus No Hemoglobin Drop-No Bleed
- Models adjusted for age, sex, hypertension, diabetes mellitus, prior PCI, warfarin, concomitant procedures

CRT-100.27

Prophylactic Anticoagulation Therapy Post-Anterior ST-Elevation Myocardial Infarction: A Systemic Review and Meta-Analysis

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BACKGROUND Left ventricular thrombus (LVT) is reported in about 12% of anterior STEMI patients in the current era using cardiac MRI. Studies investigating the role of prophylactic anticoagulation (AC) therapy in these patients have reported contradictory outcomes. Moreover, most of these studies were performed prior to the advent of more contemporary anti-platelet therapies.

METHODS PubMed and Cochrane databases were queried for studies published after 2010 comparing prophylactic AC and standard of care among patients with anterior STEMI. Data on outcomes from the selected studies were extracted and analyzed using a random effects model. Heterogeneity was assessed using an I^2 test.

RESULTS Data from six studies (two prospective randomized and four observational) with 3115 patients were included. There was no difference in the risk of LVT (OR 0.66, 95% CI [0.08-5.65]; p=0.70), systemic embolism (OR 1.59, 95% CI [0.49-5.20]; p=0.44) or mortality (OR 1.28, 95% CI [0.64-2.58]; p=0.48) with prophylactic AC. There was a higher risk of bleeding associated with AC (OR 1.91, 95% CI [1.14-3.19]; p=0.01). This association remained consistent when we investigated major bleeding events (OR 3.46, 95% CI [1.82-6.57]; p<0.01) independently. The results remained consistent when we performed sensitivity analyses after excluding studies with low rates of primary PCI, and studies that used low-dose rivaroxaban.

CONCLUSIONS Among patients with anterior STEMI, prophylactic AC was not associated with lower rates of LVT, systemic embolism or mortality, but associated higher risk of major bleeding events. There is a need for further studies examining the role prophylactic AC in more contemporary cohorts of STEMI patients taking into account rates of primary PCI, time to reperfusion, and antiplatelet therapy.