POSTER SESSION

1029   Interventional Techniques: New and Unique

Sunday, March 30, 2003, Noon-2:00 p.m.
McCormick Place, Hall A
Presentation Hour: Noon-1:00 p.m.

1029-187   A Novel Invasive Assessment of the Coronary Microcirculation

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Background: A relatively simple, invasive method for assessing the status of the coronary microcirculation independent of the epicardial artery is lacking.
Methods: Using a coronary pressure wire and modified software, which allows the pressure transducer to act as a distal thermistor and the shaft of the wire as a proximal thermistor, it is possible to calculate the mean transit time of room temperature saline injected down the left anterior descending artery (LAD) during maximal hyperemia. The inverse of this hyperemic mean transit time has been shown to correlate with absolute hyperemic flow. We hypothesized that the distal coronary pressure divided by the inverse of the mean transit time would provide an Index of Microcirculatory Resistance (IMR) that would correlate with true microcirculatory resistance (distal pressure/distal flow). Using an open-chest pig model, we compared IMR to the true microcirculatory resistance, defined as the distal LAD pressure measured with the coronary pressure wire, divided by absolute flow, measured with an external flow probe around the LAD, at maximal hyperemia. In 6 pigs these measurements were made in a normal LAD, after creation of an epicardial LAD stenosis, and after disruption of the coronary microcirculation using embolized microspheres, with and without an epicardial LAD stenosis.
Results: In a total of 31 measurements, IMR correlated with true microcirculatory resistance (r=0.52, p=0.003). The average IMR in vessels with disrupted microcirculation, irrespective on the epicardial artery status, was 30.3 ±14 versus 17.7 ±5.5 in those with normal microcirculation (p=0.002). The corresponding values for the true microcirculatory resistance were 0.93 ±0.38 versus 0.51 ±0.23 mmHg/ml/min (p<0.001). Doppler wire-derived coronary flow reserve correlated weakly with true microcirculatory resistance (r=-0.38, p=0.04).
Conclusion: This Index of Microcirculatory Resistance (IMR) provides a simple, quantitative, invasive assessment of the coronary microcirculation independent of the epicardial artery.


1029-188   Baseline Hemoglobin Is a Novel Predictor of Mortality After Percutaneous Coronary Intervention

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Background: Anemia has been reported as an important factor of adverse prognosis in various patient subgroups with critical illness, heart failure, or MI. The effect of baseline hemoglobin (BHb) level on acute and mid-term results in patients undergoing PCI has not been reported.
Methods and Results: We analyzed 6289 consecutive PCI patients at our center from July 1999 to June 2002, for in-hospital events and 1-year mortality. Patients were divided in 3 groups based on BHb: <10, 10-12, and >12 g/dL. BHb was an independent predictor of LVEF along with diabetes, MI, chronic renal failure, and number of vessel diseased. Peri-procedural creatine kinase-MB (>16 U/L) and troponin I (>2 ng/mL) elevation was significantly higher in the low BHb vs. normal BHb group (p=0.001). Even after adjustment for baseline characteristics, BHb level independently correlated with mortality on multivariate analysis (figure). Other independent predictors of mortality were: age (p=0.0001), LVEF <30% (p=0.01), symptomatic heart failure (p=0.02), peripheral vascular disease (p=0.01), and pre-PCI GP IIb/IIIa use (p=0.01).
Conclusion – In the current PCI era, among other well-established predictors of mortality, BHb <12 g/dL has been found to be an independent predictor of mortality. This may be mediated by an exacerbation of the imbalance between oxygen supply and demand present in patients with coronary artery disease undergoing PCI. The present analysis underscores the role of the stem cell function during PCI.
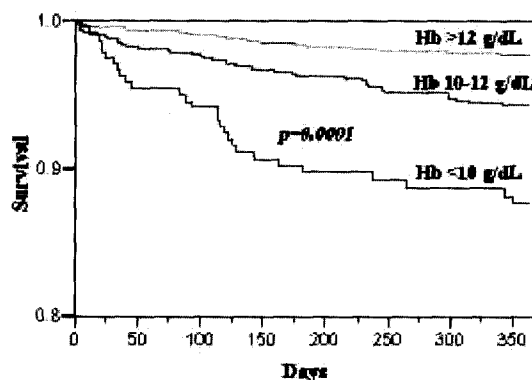
1029-189   Baseline C-Reactive Protein and Cardiac Troponin I as Predictors of Outcome Following Percutanous Coronary Intervention in Stable and Unstable Coronary Disease

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Background: Elevated C-reactive protein (CRP) appears to be strongly predictive of adverse cardiac events in stable and unstable cardiac disease. Cardiac Troponin I (cTnI) has also been shown to be a strong prognostic marker of outcome. We compared the predictive value of both markers for adverse events following percutaneous coronary intervention (PCI). **Methods:** A total of 466 (316 stable and 150 unstable) patients presenting with coronay disease suitable for PCI were studied prospectively. Baseline CRP and cTnI concentrations were determined pre-PCI and the patients were followed up for adverse cardiac events (death, Q wave MI or repeat revascularisation) for up to 18 months. **Results:** Baseline CRP was elevated in 11% of stable and 35% unstable patients ($Chi^2 = 44.5$, p<0.0001). cTnI was positive in 2.5% of stable and 25% of unstable patients ($Chi^2 = 43.9$, p<0.0001). Amongst the stable population, 56% of CRP-positive patients and 25% of cTnI-positive patients had adverse events at follow up. In the unstable patients, 57% CRP-positive and 42% cTnI-positive patients had adverse events at follow up. In stable patients, elevated baseline CRP had a positive predictive value (PPV) for adverse events of 0.6 and a negative predictive value (NPV) of 0.8 ($Chi^2 = 29.1$, p<0.0001). Baseline cTnI was not significantly predictive of long term outcome amongst the stable population. In unstable patients, CRP had a PPV of 0.6 and a NPV of 0.9 ($Chi^2 = 26.9$, p<0.0001) and cTnI a PPV of 0.6 and NPV of 0.8 ($Chi^2 = 35.7$, p<0.0001). The combination of a positive CRP and cTnI had a PPV of 0.7 and NPV of 0.8 in stable and unstable patients ($Chi^2 = 60.68$ and 54.4, respectively; p<0.0001). The Odds Ratio (OR) for adverse events at follow up increased progressively with higher quartiles of CRP: 25th centile OR 3.8 (95% CI 1.5 to 7.9), 50th centile OR 9.8 (95% CI 5.2 to 16.2) and 75th centile OR 11.6 (95% CI 4.4 to 15.7). **Conclusions:** Elevated baseline CRP is a strong and independent predictor of adverse events in both stable and unstable coronary disease. Baseline cTnI is only useful as a prognostic marker in unstable patients. The combination of an elevated CRP and cTnI provided only a marginal additional benefit to the prognostic value of CRP alone.

1029-190   Restoration of Normal Coronary Flow After No-Reflow Phenomenon Does Not Improve Post-Procedural Myocardial Infarction in Patients Without ST-Segment Elevation Myocardial Infarction

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Background: No-reflow phenomenon (NR) during percutaneous coronary intervention (PCI) is a strong predictor of major cardiac events in acute myocardial infarction (MI). We sought to determine the effects of NR on outcome and the significance of restoration of flow in patients without ST segment elevation MI(STEMI).
Methods: We evaluated 3390 PCIs performed between 1/2000 and 12/2001 in Mayo Clinic. Pts without STEMI who had an NR episode were identified and divided into 2 groups according to final angiogram [complete restoration (TIMI 3) vs. partial restoration (<TIMI 3)]. TIMI flow grades were classified as TIMI 0, 1, 2 "slow", 2 "fast" and 3 and scored as 0, 1, 2, 2.5 and 3, respectively. Pts who had an episode of NR (n=76) were compared with age, sex and segment matched controls without STEMI (n=152) in terms of in-hospital and 6-month death, MI and target vessel revascularization rates.
Results: TIMI scores from NR episode to the final angiogram improved from 1.4 ± 0.8 to 3.0 ± 0.0 in the complete group (n=34) and from 1.6 ± 0.7 to 2.4 ± 0.3 in the partial group (n=42). Despite complete restoration of epicardial flow, post-procedural MI was higher than the control group and was not different from partial restoration group (see table). Six-month outcome was similar among groups.
Conclusion: No-reflow is associated with poor prognosis even in pts without STEMI despite complete restoration of epicardial coronary flow. This finding may suggest the discordance between the blood flow in epicardial and myocardial level.

In Hospital Events

|	Control	Complete Restoration	Partial Restoration	P-value
Death	0/152 (0%)	0/34 (0%)	1/42 (2%)	0.11
Post Procedural MI	3/106 (3%)	8/26 (31%)	10/27 (37%)	<0.001
Target Vessel Revascularization	0/152 (0%)	0/34 (0%)	0/42 (0%)	-

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1029-191   Impact of the Prediabetic State on Long-Term Outcomes Following Percutaneous Coronary Intervention

Joel P. Reginelli, Mohammed Ghanamah, Derek P. Chew, Hitinder Gurm, Ivan P. Casserly, Herbert D. Aronow, Deepak L. Bhatt, Stephen G. Ellis, The Cleveland Clinic Foundation, Cleveland, OH

Background: Although diabetes is a widely accepted risk factor for worse long-term outcomes following PCI, the impact of the 'prediabetic' state remains unknown. We sought to investigate whether elevated blood glucose levels (>110) in non-diabetic patients portends a worse outcome following PCI.
Methods: From an interventional registry database, 4016 patients PCI patients were categorized as one of the following: Normal (glucose < 110), n=1688; Prediabetic (glucose >110), n=721; Diabetic on oral medication, n=989; and Diabetic on insulin, n=618. Patient outcomes were recorded for one year following PCI.
Results: Using a Cox proportional hazards model, prediabetic patients suffered a 34% increase in death and MI at one year compared to normal patients with a glucose<110 (HR=1.33, p<0.001) The risk for these patients was nearly equivalent to that of diabetics on oral medications. (See figure) On multivariate analysis adjusting for age, gender, lesion score, clinical presentation, BMI, renal insufficiency, and LV function, the prediabetic condition remained a significant predictor (HR=1.34, p<0.0001) **Conclusions:** Compared to normal non-diabetic patients undergoing PCI, presence of the prediabetic state is associated with a 34% increased risk of death or MI at one-year. This risk is equivalent to that observed among patients with non-insulin requiring diabetes, and reinforces the need for a more stringent definition of diabetes mellitus.
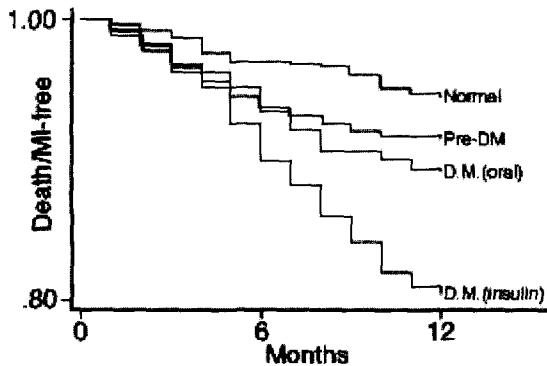
1029-192   Effect of Creatine Kinase Elevation Following Percutaneous Coronary Intervention on Long-Term Mortality

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Background: Despite general agreement on the detrimental effect of markedly elevated creatine kinase (CK) following percutaneous coronary interventions (PCI), there is conflicting evidence regarding the clinical significance of lesser degrees of CK elevation. We sought to examine the relationship between post-PCI CK elevations and long-term mortality. **Methods:** Three hospitals in New York City contributed prospectively defined data on 3497 consecutive patients who had normal pre-PCI CK levels, had not suffered a myocardial infarction (MI) within 24 hours and had post-PCI CK values at 8 and 24 hours. The primary endpoint was all-cause mortality at a mean follow-up of 3 years. **Results:** Of the 3497 patients, 359 (10%) had CK elevations above the upper limit of normal (ULN). Patients with CK elevations did not differ with regard to age, race or gender from patients without elevated CK. There was no difference in hypertension or diabetes between groups. Unstable angina was present in 48% of patients with CK elevations and 44% without elevations (P=0.104). Mean ejection fraction was 49% in patients with CK elevations and 50% in those without CK elevation (P=0.071). Stents were placed in 86% of patients who developed CK elevations and 77% of patients without CK elevations (P<0.001). Angiographic success was 97% in both groups. Following PCI, emergency bypass surgery (0.6% vs. 0%, P=0.001), Q-wave MI (0.8% vs.0.1%, P=0.001) and abrupt closure (2.2% vs. 0.4%, P<0.001) were more common among patients with post-PCI CK elevation. In-hospital mortality was 1.4% and 0.3% among patients with and without CK elevation (P=0.002). At mean follow-up of 3 years, mortality was 11% and 9.5% for patients with and without CK elevation (P=0.308). By Cox proportional hazard analysis, neither any CK elevation (Hazard Ratio (HR), 0.959, 95% Confidence Interval (CI),

0.645-1.427, P=0.838), CK elevation >2.5 X ULN (HR, 0.772, 95% CI, 0.772-2.828, P=0.239) nor CK elevation >5 X ULN (HR, 1.076, 95% CI, 0.329-3.519, P=0.904) was associated with increased mortality hazard. **Conclusion:** Post-PCI CK elevations of mild to moderate degree do not appear to be associated with an increased hazard of mortality on long-term follow-up.


1029-193   Renal Insufficiency and Anemia in Patients Undergoing Percutaneous Coronary Interventions: A Double Jeopardy

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Background: Anemia and renal insufficiency impart an adverse mortality risk in patients with congestive heart failure. There are a paucity of data on the mortality hazard associated with anemia and renal insufficiency in patients undergoing percutaneous coronary intervention (PCI).
Methods: We analyzed the 6-month mortality among patients enrolled in EPIC, EPILOG and EPISTENT trials according to degree of kidney dysfunction (Glomerular filtration rate (GFR) <60 ml/min/1.73 m^2, 60-75 ml/min/1.73 m^2 and >75 ml/min/1.73 m^2) and by hematocrit (<35, 35 to 39 and =40). GFR was calculated as GFR=186x(serum creatinine$^{-1.154}$)x(age$^{-0.203}$)x1.212 (if black)x0.742 (if female). Results: There were 20 (3.2 %) deaths among 638 patients with a Hematocrit < 35%, 41/2066 (2.0%) among patients with a hematocrit of 35 - 39, and 43/3618 (1.2%) among patients with a hematocrit >40 (P <0.001). Similarly a significant rise in mortality was seen with lower GFR [33/1168 (2.9%) at GFR < 60, 33/1766 (1.9%) at GFR 60-75 and 37/3317 (1.1%) at GFR > 75, P <0.001)]. GFR and anemia independently predicted mortality at 6 months [Figure] Conclusions: Renal insufficiency and anemia impart an independent and incremental adverse mortality hazard at six months in patients undergoing PCI.

6 month mortality based on pre-procedural GFR and hematocrit
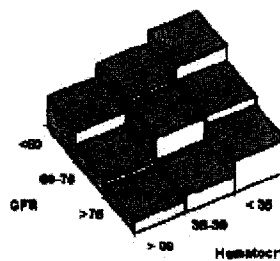
1029-194   Successful Late Reperfusion by Primary Angioplasty Reduces Risk of Mechanical Complication in Patients With Acute Myocardial Infarction

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Background: Early thrombolysis decreases and late thrombolysis increases risk of mechanical complication (MC) in patients with acute myocardial infarction (AMI). Although early reperfusion by primary angioplasty reduced the risk of MC compared to thrombolysis, however it has not been elucidated whether late reperfusion by primary angioplasty reduces the risk of MC.
Objective: The aims of the study are to examine the incidence and clinical characteristics of MC and to evaluate the effect of late reperfusion on MC in patients with AMI treated with primary angioplasty.
Methods: Of 3320 patients with AMI registerd in Osaka Acute Coronary Insufficiency Study (OACIS), consecutive 2111 patients treated with primary angioplasty within 72 hours after the onset of AMI were selected as study subjects. Patients were divided into 2 groups according to elapsed time from the onset of AMI (early reperfusion (ER) group ≤12 hours; n=1379, late reperfusion (LR) >12 hours; n=384). The remaining 348 patients who failed reperfusion by angioplasty were classified as no reperfusion (NR). MC was defined as cardiac ventricular free wall rupture, ventricular septal perforation and acute mitral regurgitation.
Results: Incidence of MC was most frequent in NR group (ER:1.4%, LR:1.3%, NR:5.2%, P<0.01). After adjustment for baseline characteristics and treatments, the risk ratio for MC in LR group was similar to that in ER group (Odds ratio (OR) 1.62 95% confidence interval (CI) 0.62-4.24, P=0.32), whereas LR group had a lower risk for MC than NR group (OR 0.11, 95% CI 0.02-0.70, P=0.02). Multivariate analysis revealed that independent predictors of mechanical complication were age≥ 70 (OR 3.29, 95% CI 1.34-8.07, P=0.01), Killip ≥ II (OR 4.03, 95% CI 1.69-9.61, P<0.01), absence of collateral vessel (OR 4.10 95% CI 1.18-14.19, P=0.03), and failure of angioplasty (OR 2.46, 95% CI 1.01-5.98, P=0.048). **Conclusion:** Successful late reperfusion does not increase the risk of mechanical complication in patients with AMI. Apart from thrombolytic therapy, late reperfusion by primary angioplasty has a beneficial effect on preventing the mechanical complication.