Differences in Coronary Pathway Anatomy Determine Collateral Function in Chronic Coronary Occlusions

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The anatomical location of collaterals varies widely in total chronic coronary occlusions (TCO). Collaterals can run through intramyocardial pathways, or epicardially. It is unknown whether collateral anatomy and non-culprit plaques are related to differences in collateral supply in man. Collateral function was assessed in 65 patients by simultaneous recording of intracoronary Doppler velocity and pressure distal to a TCO before recanalization. Recruitable collateral function was determined at the end of the PTCA during a final balloon dilatation. The average peak Doppler velocity (APV) and the diastolic/systolic velocity ratio (ADSVR), mean pressure distal to the occlusion (PD), and aortic pressure (Pao) were determined. The collateral resistance was calculated: Rc=(Pao-PD)/APV. 

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Results: Despite mild angiographic disease, there was substantial plaque burden in all vessels (mean plaque volume 227.9±15.59 mm3). There was a strong correlation between plaque volume and external elastic memban (EEM) volume (Fig.), indicating adequate compensatory vessel enlargement. In contrast, there was no correlation between percent stenosis and lumen volume (R2 = 0.11, P = NS), suggesting that vascular remodeling completely compensates for the plaque accumulation in early atherosclerosis.

Conclusion: Volumetric ultrasound assessment of mildly diseased coronary arteries indicates that compensatory vessel enlargement occurs early in the atherosclerotic process. Our data suggest that enlargement of the EEM area completely compensates for plaque accumulation early in the disease process.

MODERATED POSTER SESSION
1195MP Moderated Poster Session...Percutaneous Coronary Intervention III
Tuesday, March 19, 2002, 3:00 p.m.-5:00 p.m.
Georgia World Congress Center, Hall G
3:00 p.m.

1195MP-121 Use of a Sonospectroscopic Digital Electronic Stethoscope to Evaluate Changes in Acoustic Signature of Coronary Flow Before and After Percutaneous Coronary Intervention (PCI)

Background: The identification of coronary stenoses by a simple, noninvasive method remains an elusive goal. Turbulent blood flow caused by coronary narrowing produces acoustic signals in the 300-1800 Hz audio band. These sounds are occasionally audible with the standard stethoscope (Duct's murmur). We attempted to locate signals below the audible threshold using a sonospectrographic digital stethoscope (Sonomed Model 100) to identify sounds associated with coronary stenoses (microbruits).

Methods: Digital, high-frequency recordings were obtained from nine precordial locations. These data were processed, filtered and parsed to frame the diastolic time interval for time-frequency detection of likely coronary microbruits. An algorithm using signal detection studies was used to evaluate the spectral characteristics of diastolic sounds to derive a flow microbruit score (FMS). This method was applied before and after PCI in thirteen patients with 20 coronary lesions.

Results: There was a strong trend toward reduction in FMS following PCI at the precor-dial site nearest to the target lesion. Compared to pre-intervention readings, 16 (80%) decreased, 2 (10%) increased, 1 (5%) was unchanged, and 1 (5%) was indeterminant. Initial modeling indicates that this reduction is statistically significant (difference of means, p=0.003).

Conclusions: Using a sonospectroscopic digital stethoscope to identify probable coronary microbruits, we demonstrated a significant change in a derived flow microbruit score following PCI. A larger trial is planned to validate these findings and to relate the FMS to stenosis severity by coronary angiography. If this method can accurately and reproducibly identify the presence and severity of coronary stenosis noninvasively, it would be a valuable tool for both screening patients and for assessing the efficacy and durability of PCI.

1195MP-122 Failure of PTFE-Covered Stents to Lower Restenosis Rate in Aorto-Ostial Lesions
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The efficacy of PTFE-covered stents in ostial aorto-coronary (AC) lesions has not been evaluated. The aim of this study was to evaluate the outcome of patients (pts) in which PTFE-covered stents were implanted in ostial AC lesions. Methods. In this study 25 consecutive pts were included (mean age: 63.3 ± 9.2 years). Ostial AC lesions were located:
14 in SVGs, 10 in right coronary arteries and 1 in a protected left main coronary artery. In 18 pts the covered stents were implanted in de novo lesions and in 7 pts for the treatment of in-stent restenosis. The lesion length was 7.7 ± 5.2 mm and the stent length was 17.7 ± 6.1 mm. All pts were discharged under ticlopidine and aspirin for at least 3 months. Results: The procedural success rate was 100%. During hospitalization 2 pts had myocardial infarction (MI); one Q-wave and 1 non-Q-wave MI. Acute or subacute thrombosis was not observed. During the clinical follow-up period (13.1 ± 11.2 months) 2 deaths were encountered and one patient had MI. Target lesion revascularization was performed in 8 lesions. Fourteen pts (56%) were event-free during the follow-up period. Angiographic follow-up was performed in 15 pts after 6.1 ± 2.7 months (table). Restenosis of the target lesion was observed in 8 lesions (53%). Restenosis was focal in 7 lesions and diffuse in 1 lesion. The late loss was 1.8 ± 1.5 mm and the loss index was 0.7 ± 0.7. Conclusion: The first evaluation of PTFE-covered stents in ostial AC lesions showed that the incidence of angiographic and clinical restenosis remains high.

Table Before Immediately After Follow-up

Reference Diameter (mm) 3.50 ± 0.63 3.82 ± 0.59 3.50 ± 0.81
Minimal Lumen Diameter (mm) 1.10 ± 0.60 3.66 ± 0.63 1.89 ± 1.92
Stenosis (%) 69.99 ± 14.75 3.31 ± 6.72 47.89 ± 34.72

* p<0.01 ** p<0.005

3:24 p.m.

1195MP-123 Effect of Stenting on the Instantaneous Diastolic Flow Velocity: Pressure Gradient Relation in Patients With a Severe Coronary Stenosis

In the cath lab, the significance of a coronary stenosis can be assessed by the coronary flow reserve (CFR) or the fractional flow reserve (FFR). Each of these techniques however has limitations. Animals, the instantaneous diastolic flow velocity - pressure gradient (v-dp) relation has been demonstrated to express accurately the hemodynamic impact of coronary stenoses. Data in humans are rare. In this study we examined the effect of a coronary stenosis and the effect of stenting on the v-dp relation in 7 patients. A Doppler wire and a pressure wire were positioned distal to the coronary stenosis. After administration of adenosine the instantaneous flow velocity, the proximal and distal coronary pressure were recorded digitally (sample frequency 100Hz). For each coronary artery the mid-distal v-dp data of one cardiac cycle at maximal and intermediate hyperemia and at baseline were plotted on an X-Y scatter plot. A regression line was calculated using the equation: v=ax+bx^2. In all patients stenting was performed successfully. The mean diameter stenosis before PTCA was 70% and was reduced to 5% after stenting (61% vs 39%; p<0.01). The rate of progression compared with lesion characteristics, lesion characteristics, and procedural factors. The restenosis rate of diabetes before RA was significantly higher than that of non-diabetics in the follow-up period (41% vs 13%; p<0.05). Conclusions: We conclude that RA is not effective for ostial stenosis in diabetics compared with non-diabetics.

DM (n=29) Non-DM (n=30)

ACC/AHA Type B2 19 (63%) 19 (63%)
Type C 7 (23%) 7 (23%)
Lesion length(mm) 9.86±7.30 9.47±6.48
Reference (mm) 2.90±0.53 3.01±0.47
MLD (mm) 0.86±0.39 0.95±0.44
Before
After
2.80±0.71 2.86±0.57
Burn/Artery ratio 0.70±0.11 0.69±0.10
Restenosis (%) 14/17 (61%) 9/23 (39%)*
Progression (%) 7/17 (41%) 3/23 (13%)**

3:48 p.m.

1195MP-125 Predictors of Adverse In-Hospital Events Following Percutaneous Coronary Revascularization in the Current Era: A Report From the NHLBI Dynamic Registry
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Background: Although stents and antithrombotic agents have enhanced the safety and effectiveness of percutaneous coronary intervention (PCI), in-hospital death and myocardial infarction (MI) are still observed. In an attempt to reduce the incidence of these adverse events further, we sought to identify those factors associated with their occurrence. Methods: In-hospital outcomes and baseline and procedural characteristics were analyzed among 4569 patients (pts) enrolled in 17 centers within the NHLBI Dynamic Registry. To detect the influence of evolving therapies and techniques, patients were included from two enrollment waves, 1997-98 and 1999. Multivariable models were developed from a universe of variables potentially associated with death or death and MI. Results: Death occurred in 69 pts (1.5%) and death/MI in 191 pts (4.1%). Independently associated variables for death included total occlusion attempted (Odds Ratio 2.2, 95% 95% Confidence Interval 1.2-4.1), increasing age (1.1, 1.0-1.1), history of CHF (2.7, 1.4-5.3), renal failure (3.5, 1.6-7.8), attempted vessel supplies collaterals (2.5, 1.0-6.1), cardiogenic shock (6.4, 9.2-22.7), >2 lesions attempted (1.8, 1.3-2.6) and urgent procedure (2.8, 1.3-6.2). When the combined endpoint of death/MI was analyzed, evidence of thrombus (1.8, 1.3-2.6) and peripheral vascular disease (1.7, 1.1-2.7) were positively associated while use of ticlopidine (0.6, 0.4-0.9) had a protective effect. Neither stents nor planned use of IIb/IIIa antagonists had a protective effect and MI as an indication for PCI did not increase risk. Conclusion: Multiple factors were associated with death or death/MI. The presence of extreme hemodynamic impairment at procedure outset was most influential while advanced age, renal failure and peripheral vascular disease were other contributing baseline variables. Attempting a total occlusion, presence of thrombus, a vessel that supplies collaterals or more than one lesion are variables that should be considered when selecting pts for PCI or in planning procedural strategies.

4:00 p.m.