percent of these patients reported that symptoms of infection started within one week prior to the MI onset. Using the case-crossover analysis, the odds ratio of MI for infections one day prior to MI onset was 2.4 (95% CI: 1.7–3.4), compared to the seventh day prior to the onset.

Conclusion: Although external control data are not available, the finding that 17% of patients in this large database report an infection in the week prior to MI onset is compatible with the possibility that infection triggers MI. This finding coincides with recent studies linking infection and inflammation to atherosclerosis, supports the need for controlled studies of infection as a trigger.

1055-72 Cocaine Use as a Trigger of Acute Myocardial Infarction

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Although anecdotal reports indicate that cocaine use can trigger acute myocardial infarction (MI) onset, there have been no controlled studies of the magnitude of the increased risk, nor the duration of the hazard period. We therefore collected data in the Onset Study to rigorously evaluate this association.

Between August 1989 and September 1996 we interviewed 3,946 patients with acute MI at 45 medical centers across the United States. Patients were interviewed an average of 4 days following MI onset. A self-matched case-crossover approach was used to evaluate the relative risk of MI onset following cocaine use.

Of the 3,946 patients interviewed, 38 (0.9%) reported cocaine use in the year prior to the onset of MI, and 9 reported use within the 60 minutes before the onset of their MI symptoms. Cocaine users were more likely to be male (87% vs 67%, $p = 0.01$), younger (44 ± 8 vs 61 ± 13 years, $p < 0.001$) and non-white (61% vs 11%, $p < 0.001$) compared with non-users. The risk of MI onset was elevated 23.7 fold (95% CI, 8.5 to 66.2) in the 60 minutes following cocaine use and rapidly returned to baseline beyond the first hour.

Conclusion: Cocaine use is associated with a large abrupt increase in the risk of acute MI in subjects who are otherwise at relatively low risk. Drug education campaigns ought to include information regarding the magnitude of this risk. This finding also suggests that studying the pathophysiologic changes produced by cocaine may provide insights into the mechanisms of triggering.

1055-73 Difficult to Control Neurally Mediated Syncope: Is it Familial

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Familial tendency in difficult to control (DTC) neurally mediated syncope (NMS) has been described in sporadic forms. However pattern of inheritance, if present, has not yet been identified. Therefore, the charts of 35 patients (pt's) with DTC-NMS who were enrolled in a clinical study were reviewed retrospectively. DTC-NMS is defined as a pt with recurrent NMS that occurs at least once monthly, has a positive head up tilt that reproduced symptoms, and unresponsive to conventional therapy. 26/35 available and consenting pts were contacted by telephone to inquire the detailed family history of such disorder. The pedigrees of kindreds were constructed and analyzed by a clinical geneticist (GS).

Results: 14/26 pts with syncope/presyncope (average of 10 episodes/month) failed conventional treatment and had a family history of such disorder were identified. Ten pts had no family history of DTC-NMS up to three generations. One pt died and the other was adopted. Two pts were related as mother and son. 13 pedigrees were constructed. There were 46 affected kindreds with nearly equal male to female ratio (22/24 respectively). 33/46 affected individuals were among first degree relatives. Male to male transmission was noted in one pedigree, suggesting that this is not an X-linked trait. There was one instance of an affected mother transmitting the condition to two sons with different fathers. Incomplete penetrance (transmissions of the trait from a non-affected obligate gene carrier) was noted in three pedigrees.

Conclusion: Genetic analysis of the pedigrees from 13 kindreds suggests autosomal dominant inheritance with incomplete penetrance in patients with DTC-NMS.

1055-74 Safety Baseballs Reduce Ventricular Fibrillation and EKG Changes in a Biological Model of Commotio Cordis, Sudden Death From Low Energy Chest Wall Impact

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Background: Commotio cordis is sudden death resulting from a strike to the chest with a low energy object (typically a baseball). The etiology is thought to be ventricular fibrillation (VF). There is uncertainty about whether softer than standard (safety) baseballs will reduce the risk of sudden death in these young athletes.

Methods: In a juvenile swine model, VF could be reproducibly induced by 30 mph baseball strikes occurring 15 to 30 ms prior to the peak of the T-wave. We impacted 24 animals during this vulnerable period of the cardiac cycle with up to 3 strikes with either a standard baseball or a safety baseball (designed for players aged 5 to 7 years).

Results: Significantly fewer episodes of VF were seen in the animals impacted with a safety baseball ($p = 0.03$). In the 12 animals impacted with a safety ball there were 2 episodes of VF with 27 strikes. In the 12 animals impacted with a standard baseball there were 8 episodes of VF with 23 strikes. In addition, there were significantly fewer episodes of ST elevation, and bundle branch block with a safety ball.

	Standard ball	Safety ball	P-value
Ventricular Fibrillation	8/23 (35%)	2/27 (7%)	0.03
Heart block	3/15 (20%)	1/25 (4%)	0.10
ST elevation	8/15 (53%)	4/25 (16%)	0.03
Bundle branch block	4/15 (27%)	0/25 (0%)	0.03

Conclusion: Safety baseballs decrease the risk of ventricular fibrillation in a swine model of low energy chest wall impact. These findings emphasize potential methods of reducing sudden death in the young athlete.

1055-75 Is Preparticipation Screening for Cardiovascular Disease Adequate in United States High Schools?

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Background: Sudden death in young student-athletes due to unsuspected cardiovascular (CV) disease has heightened public interest in preparticipation screening.

Methods: To understand the limitations of screening for detecting important CV lesions, 51 state high school jurisdictions were contacted to determine their guidelines for implementation of screening.

Results: Of the 51, 9 (18%) have no recommended history/physical questionnaire to guide examiners. Of the remaining 42 states, only 7 (17%) had adequate forms when measured against 1996 American Heart Association guidelines. History forms showed relevant items were present in ~60% e.g., prior heart disease, murmur, dyspnea/chest pain, familial heart disease, or prior sports exclusion. Physical exam forms also showed high omission rates: ~20% had murmurs, irregular rhythm, blood pressure, Marfan stigmata. All states recommend physicians perform screening; however, 16 permit nurses/physician assistants and 11 provide for chiropractors.

Conclusions: Athletic screening currently in place in U.S. high schools to detect CV disease: 1) is highly dependent on history/physical exam forms that are frequently abbreviated/inadequate; 2) is implemented by various health care workers with different levels of expertise; 3) is severely limited in its power to detect lethal CV lesions. These observations represent an impetus to change/optimize athletic screening process.

1055-76 Reducing Exercise-related Sudden Cardiac Death Rates Among Recruits by Prevention of Exertional Heat Illness

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Background: Two thirds of exercise-related death (ERD) of recruits are without preexisting disase: one third unexplained sudden cardiac death (U-SCD) and one third fatal exertional heat illness (EHI). Speculating that unrecognized EHI might cause U-SCD, deaths might be prevented by adjusting exercise intensity, rest cycles, and water intake hourly to the on-site wet bulb globe temperature index.

Methods: To test the effect of this intervention, we enumerated recruits, surveyed training practices, determined etiology for 96 ERDs from autopsy protocols, clinical records, eyewitness accounts, toxicology, and

cardiopathology review. We compared U-SCD rates (per 8 week training cycle) at all centers before (1977–'81: 2.1 million recruits) versus during intervention (1982–'91) at Participant (Army, Air Force, Marines at SC: 2.3 million recruits) and Non-Participant Centers (Navy, Marines at CA: 1 million recruits).

Results: Participant U-SCD rates fell from $0.8/10^5$ before to $0.26/10^5$ recruit-cycles during intervention (RR = 0.33, 95% CI 0.12–0.87, P = 0.02). Non Participant U-SCD rates fell from $0.85/10^5$ before to $0.77/10^5$ recruit-cycles during intervention (RR = 0.91, 95% CI 0.3–2.8, P = NS). Mortality rates before 1982 predicted more deaths than observed during intervention: 27 versus 14 U-SCDs and 22 versus 11 EHI deaths. This implied 23 lives saved during 1982–'91 at Participant and one at Non-Participant Centers (P < 0.004).

Conclusions: Exertional heat illness is a major preventable risk factor for exercise-related sudden cardiac death of young adults.

1056 Inflammatory Cytokines and Neuroendocrine Factors in Acute Ischemic Syndromes: Basic Aspects

Monday, March 30, 1998, 3:00 p.m.–5:00 p.m.
Georgia World Congress Center, West Exhibit Hall Level
Presentation Hour: 4:00 p.m.–5:00 p.m.

1056-107 Control of Endothelin Release Within the Heart: Vasomotor and Inotropic Implications During Ischemia/reperfusion

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Background: The vasoactive and positive inotropic effects of Endothelin (ET) are mediated by ET_A and ET_B receptors. The aims of the present study were to investigate the role of endogenous ET in maintaining coronary vasomotion and cardiac force of contraction (F) during acute ischemia using BQ123 (ET_A antagonist) and bosentan (Bos, ET_A/ET_B antagonist).

Methods: Langendorff perfused rat hearts (n = 58) were used with heart rate maintained constant. Global ischemia was induced 10 minute after introduction of BQ123 (10^{-6} M) or Bos (10^{-7} M). Force of contraction was monitored. ET-1 efflux was measured by radioimmunoassay.

Results: Both BQ123 and Bos perfusion induced a increase ($p < 0.05$) of ET-1 efflux rate 730 ± 188% & 315 ± 80% respectively, mean ± SEM). BQ123 but not Bos perfusion induced a progressive decrease ($p < 0.01$) in perfusion rate. This flow reduction persisted after wash-out of BQ123. In the absence of ET antagonists, there was a post-ischemic vasodilation on restoration of flow. BQ123 but not Bos abolished this post-ischemic vasodilator phase ($p < 0.05$). Neither BQ123 nor Bos induced variation in F. Ischemia induced a transient decrease in F (18.5 ± 5.7%, $p < 0.05$). This decrease in F during ischemia was accentuated by Bos (38.6 ± 8.6%, $p < 0.05$) but not BQ123. Neither BQ123 nor Bos affected recovery of F post ischemia.

Conclusions: (1) Both BQ123 and Bos increased ET-1 efflux, suggesting the presence of ET_A receptor-mediated negative feedback regulation; (2) only BQ123 exerted vasoconstrictor effects reflecting ET-1/ET_B receptor interaction; (3) Bos effects on F indicate that ET may be important for maintaining cardiac systolic function during acute ischemia.

1056-108 Interleukin-6 Release Predicts Myocardial Recovery (stunning) After Acute Myocardial Infarction

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Background: Elevated plasma levels of Interleukin-6 (IL-6) have been demonstrated in patients with acute myocardial infarction (AMI). Recent studies suggest that IL-6 might be causally involved in myocardial contractile dysfunction after AMI.

Methods: We investigated reversible myocardial dysfunction after AMI (recovery/stunning) in relation to Interleukin-6 release during the first 48 hours after onset of chestpain in 44 patients with first AMI. Infarct size was assessed enzymatically (72-hours cumulative LDH release) and by 2D-echocardiography (wall motion score index (WMSI) at 3 months). Myocardial recovery was defined as improvement of function of 2 or more myocardial segments at 3 months compared with admission.

Results: Patients with (n = 32) and without (n = 12) recovery were comparable with respect to gender, infarct localization, therapy, treatment delay and echocardiographic indices at admission. However, age, early reperfusion and 48-hours IL-6 release reached statistical difference. IL-6 release was found to be significantly lower in patients with recovery of function. Multivariate regression analysis identified IL-6 release as independent predictor of recovery of myocardial function after AMI.

Variable	Univariate		Multivariate	
	Wald X^2	P	Wald X^2	P
IL-6 release (48 hrs)	5.5	0.019	5.5	0.019
Early reperfusion	5.0	0.025	–	NS
Age	4.5	0.03	–	NS

Furthermore, IL-6 release correlated with infarct size (Pearson correlation) (cumulative LDH: r = 0.41, P = 0.002; WMSI at 3 months: r = 0.47, P = 0.001).

Conclusions: IL-6 release in AMI is inversely related to myocardial recovery/stunning. Myocardial necrosis is associated with IL-6 release.

1056-109 Myocardial Neutrophil Accumulation After Coronary Intimal Injury, With and Without Ischemia. Effect of Aspirin

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Background: It has been shown that coronary intimal injury (CI) increases myocardial damage after transient coronary occlusion (CO), and that aspirin attenuates this influence. A reduced inflammatory response could contribute to this effect of aspirin.

Methods: The effect of CI and aspirin on myocardial accumulation of neutrophils was investigated in open-chest pigs (25–30 kg) submitted to catheter-induced CI of the LAD. Eigth pigs received CI, 5 CI and induction of cyclic flow reductions (CFVs) reflecting extensive thrombosis, 5 CI followed by 25 min CO of the LAD (no infarction), and had CFVs, and 5 received 250 mg iv aspirin 90 min before CI, and did not have CFVs. After 2 h myeloperoxidase (MPO, U/g) activity was quantified in samples from LAD-dependent and control myocardium.

Results: MPO activity was increased in all groups in LAD territory respect to the control region (0.40 ± 0.01 vs 0.017 ± 0.004 respectively, p = 0.039). Neither CFVs nor CO were associated with increased MPO activity in LAD region respect to the animals with CI alone (0.059 ± 0.026, 0.025 ± 0.015, and 0.037 ± 0.015, respectively, p = NS). In aspirin-treated animals MPO activity was lower than in the remaining animals, both in LAD territory (0.017 ± 0.008 vs 0.042 ± 0.010 respectively, p = 0.04) and in control region (0.002 ± 0.001 vs 0.018 ± 0.004, $p < 0.001$).

Thus, CI induces neutrophil accumulation in downstream myocardium, whose magnitude is not further increased by CFVs or by brief myocardial ischemia without necrosis. Aspirin reduces this accumulation, which could contribute to its beneficial effects in acute coronary syndromes.

1056-110 Intrinsic Cardiac Neuroendocrine System Mediates Ischemic Myocardial Adaptation

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Background: ACE-inhibition induced ischemic cardioprotection is attributed to bradykinin (BK) receptor activation. Our previous study demonstrated that cardioregulatory action of BK is mediated by stimulation of the intrinsic cholinergic system. We examined the mechanistic role of these intrinsic neuroendocrine pathways in adaptation of myocardial (systolic-diastolic) function to ischemic stress.

Methods: Ischemic preconditioning (IP) protocol (5-min occlusion/10-min reperfusion) preceding a prolonged no-flow ischemic stress (20-min global ischemia/60-min reperfusion; I/R) was used to evoke the endogenous adaptive reserves of a centrally denervated isolated rabbit hearts (n = 27). The cardiac paracrine function was modulated by use of an ACE-inhibitor (captopril-CAP; 10^{-5} M) or BK-B_2 receptor antagonist (HOE140; 3×10^{-7} M). The participation of specific intrinsic neural pathways was "dissected" by use of hexamethonium (HEX, 10^{-4} M) or atropine (ATR, 10^{-6} M).

Results: The hearts subjected to IP preserved a greater portion of their contractile function compared ($p < 0.01$) to the hearts exposed only to I/R protocol (62 ± 3% vs 40 ± 2% of the initial level of developed intramyocardial tissue pressure - IMP). CAP potentiated the beneficial effects of IP (recovery increased to 74 ± 3%). The passive myocardial properties were preserved better in IP compared ($p < 0.01$) to I/R (38 ± 5% vs 394 ± 33% rise in diastolic-IMP); this IP effect remained unaltered by CAP. HOE140, ATR and HEX antagonized fully the systolic and diastolic protective effects of IP.

MONDAY POSTER