Conclusion: There is a significant variation in measured atrial DFT with a nadir in the morning. This is the converse to measurements of ventricular DFTs suggesting different regulatory electrophysiological mechanisms.

### 1139-16

#### Linearity of Myocardial Electric Field With Respect to Transmural Current

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**Background:** When myocardial electric fields produced by transmural defibrillation shocks are modeled using the finite element method, it is generally assumed that tissue conductivity is independent of the applied voltage and current. This assumption implies a linear relation between the electric field magnitude and transmural current, which has not been verified experimentally. We conducted a study to assess the hypothesis that the myocardial electric field is a linear function of transmural current.

**Methods:** In each of 6 dogs, 5 calibrated single-plunge triaxial electrode arrays were placed in the left ventricle. The signal output from the arrays was water-based (through the median sternotomy) and connected to the data acquisition system. Shocks were delivered through external stainless steel electrodes with a constant 50-Newton force applied. The defibrillator was discharged through a current divider that allowed precise selection of the delivered current. Six shocks were delivered at 10-minute intervals over a range of 14 to 28 amperes. Before each shock, the heart was fibrillated for 10 seconds. The total sample size for each dog therefore consisted of 36 shocks for each of 5 sites. Data were analyzed by first extracting the peak value of each damped-sinusoidal pulse using a multiple regression curve fit. Then, for each dog, linear regression was performed for the electric field magnitude at each site versus the 6 values of transthoracic current, and the correlation coefficient (r) was calculated. The mean and standard deviation were then calculated for r over the 30 total sites.

**Results:** The range of r was 0.870 to 0.999. The corresponding mean and standard deviation of r were 0.970 and 0.030, respectively. At 41.4% of the sites, r was greater than 0.990.

**Conclusions:** These results validate the hypothesized linear relation between the myocardial electric field magnitude and transmural current. These findings are important for verification of numerical defibrillation models using results from experimental measurements.

### 1139-19

#### Safety and Feasibility of Dobutamine-Atropine Stress Echocardiography for the Evaluation of Myocardial Ischemia in Patients With Implantable Cardioverter Defibrillators

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**Background:** Coronary artery disease is the underlying etiology of left ventricular dysfunction and arrhythmias in the majority of patients receiving implantable cardioverter defibrillator (ICD). In most laboratories, patients at high risk of ventricular arrhythmias are excluded from dobutamine stress echocardiography (DSE) due to the arrhythmogenic effect of dobutamine. The aim of this study was to assess safety and feasibility of DSE in patients with ICD.

**Methods:** DSE (dobutamine up to 50 μg/kg/min-atropine up to 2 mg) was performed in 85 patients with ICD and known or suspected coronary artery disease. The ICD was inactivated prior to the stress test and reactivated after the study. Ischemia was defined as new or worsening wall motion abnormality. A feasible study was defined as achievement of the target heart rate (+25% of maximal heart rate predicted for age) and/or an ischemic endpoint (angiinal, ST segment depression or reversible wall motion abnormality).

**Results:** Mean age was 67±11 years (60-90). Mean ejection fraction was 26±10%. Regional wall motion abnormalities were detected in 76 (92%) patients at rest. No death, myocardial infarction or sustained ventricular arrhythmias occurred during the DSE. Non-sustained ventricular tachycardia occurred in 6 (7%) patients and sustained ventricular tachycardia occurred in 1 (1%) patient. Episodes were terminated spontaneously, by termination of the test or by administration of intravenous metoprolol. The target heart rate was achieved in 75 (88%) patients. DSE was positive for ischemia in 30 (35%) patients. Angina occurred in 9 (11%) patients and ST-segment depression occurred in 14 (16%) patients. The test was considered feasible in 81 (95%) patients.

**Conclusion:** DSE is a safe and feasible method for evaluation of myocardial ischemia in patients with ICD and drug-induced diastolic fraction.

### 1139-20

#### Outcomes and Shock Experience of Implantable Cardioverter Defibrillator Patients on Chronic Hemodialysis

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**Background:** The Implantable Cardioverter Defibrillator (ICD) is highly effective in terminating ventricular fibrillation and in aborting sudden cardiac death (SCD). The occurrence of ventricular fibrillation in ESRD patients on hemodialysis (HD) is common and occurs during HD and between treatments. During HD, the incidence of arrhythmias is enhanced because of rapid fluctuations in hemodynamics and electrolyte concentrations, especially in patients with a high incidence of myocardial disease. Studies examining the role of potassium in dysrythmias found a correlation between changes in the plasma potassium concentration during dialysis and the incidence of arrhythmias. Consequently, we sought to determine the outcome and shock experience of ICD patients on chronic HD.

**Methods/Results:** We reviewed a prospectively collected ICD patient database and the charts of the ICD patients who were on chronic HD secondary to ESRD. Out of 424 ICD patients implanted at our institution from 1995 to 2002, 112(5%) were on HD. The mean age of this group was 60.9±6 years. The mean EF was 24±8%. Five patients had ischemic cardiomyopathy while the remainder had non-ischemic cardiomyopathy. Seven out of these 11 patients received ICD shocks. There were 7 cluster shocks (>3 shocks in 24 hours) in 5 out of 11 (45.4%) patients due to VT storm. The incidence of cluster shocks in our general ICD population was 48 out of 424 (11.3%) [p=0.0006]. The cluster shocks occurred during dialysis therapy using low potassium baths and resolved with potassium supplementation. One death occurred in the ICD patients due to MNOA bacteremia. Three of these 11 patients died within one year of implant (27%) while 59 out of 424 general ICD patients died (13.9%) [p=0.43]. Conclusion: ICD patients on chronic HD are more likely to have cluster shocks secondary to VT storm compared to the general ICD population. This appears entirely due to electrolyte solutions during dialysis and is amenable to correction with altered dialysis fluids. To reduce the risk of adverse arrhythmic events during HD, the dialysate prescription should be evaluated and modified for ICD patients.