

P3. IMPLANTABLE CARDIAC DEFIBRILLATORS IN THE PEDIATRIC POPULATION. R. Maciver¹, R. Stewart², C. Backer², K. Ward², B. Deal², W. Franklin², S. Tsao², C. Mavroudis²; ¹Northwestern Memorial Hospital, Chicago, IL, ²Childrens Memorial Hospital, Chicago, IL

Background: The use of Implantable Cardiac Defibrillators (ICD) in the pediatric population is increasing with expanding indications. The rate of appropriate and inappropriate delivery of shocks is not well known. The purpose of this study was to identify the incidence of delivered shocks and correlate these with patient characteristics. **Methods:** A retrospective review of 62 children and young adults having an ICD placed between 8/95 and 2/06 was performed. The mean age was 16.8 ± 7.9 years. Diagnoses at implantation were Long QT syndrome (n = 13), hypertrophic cardiomyopathy (n = 9), and arrhythmia due to structural heart disease (n = 38). The mean follow-up was 20.5 ± 19.7 months. **Results:** There were no arrhythmic deaths and one death due to heart failure. Eight devices malfunctioned, 4 due to lead fracture and 4 due to loss of capture. There were no device-related infections. Four patients received 7 shocks for ventricular fibrillation (aborted death). Eight patients received 10 inappropriate shocks over 32,644 patient-days of follow-up. The majority of these inappropriate shocks were for atrial tachyarrhythmias. **Conclusions:** ICDs can be life-saving in children effectively in the long QT syndrome, hypertrophic cardiomyopathy and structural heart disease patients. Inappropriate shocks remain a problem and warrant efforts to improve patient compliance and better analytical programming of ICDs to differentiate between atrial and ventricular arrhythmias.

P4. ABLATION OF THE ATRIOVENTRICULAR NODE IN A RABBIT MODEL. R. Maciver¹, R. D. Stewart², C. Backer², S. Tsao², D. Harrington², C. Mavroudis²; ¹Northwestern Memorial Hospital, Chicago, IL, ²Childrens Memorial Hospital, Chicago, IL

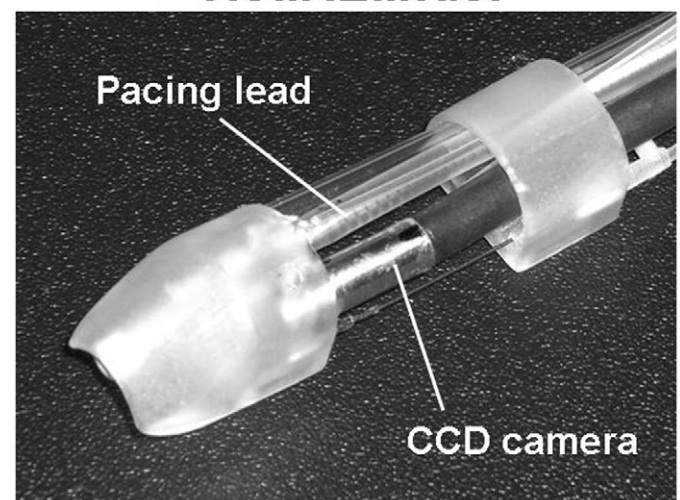
Background: The Atrioventricular Node (AV) node is permanently damaged in approximately 2% of congenital heart surgery operations. The current therapy for permanent damage to the AV node is a permanent pacemaker. Efforts at the creation of a tissue engineered AV node replacement require an appropriate animal model prior to human studies. We describe the development of a model of complete heart block with pacemaker implantation in a rabbit. **Methods:** With Institutional Animal Care and Use Committee approval nine New Zealand rabbits were brought to the operating room for ablation of the AV node and placement of a ventricular epicardial pacemaker. Following general endotracheal anesthesia, the heart was approached through a right thoracotomy. After opening the pericardium a Medtronic unipolar epicardial pacemaker lead was sewn to the right ventricle and connected to a single chamber generator placed in a submuscular pocket inferior to the incision. The atrial appendage was retracted to expose the area of the AV node for ablation by injection. Initial attempts to ablate the node with 70% alcohol were unsuccessful leading to the use of 10% Formalin. Initially performed by topical landmarks with limited precision, a novel device was developed which allowed for continual monitoring of the needles location by real time electrocardiogram. Pacing was performed at a rate of 180 once heart block was achieved. A chest tube was placed and removed once the animal had fully recovered from anesthesia. **Results:** There were two operative deaths. Acute heart block was successful in 8/9 rabbits. Recovery of the AV node occurred in 2/7 rabbits who survived the initial surgery. Rabbits were sacrificed between one and three weeks. Average survival was 17 days (± 10 days). There were no device related infections. 2/7 rabbits developed progressive tachypnea (Average POD 19 ± 4 days) and signs of distress and were subsequently euthanized. On necropsy, both

were found to have massive bilateral pleural effusions. **Conclusions:** A successful model of complete heart block with pacemaker placement has been developed in the rabbit and will facilitate the development of a tissue engineered AV nodal replacement. The use of formalin and a novel injection device effectively increased our rate of successful heart block.

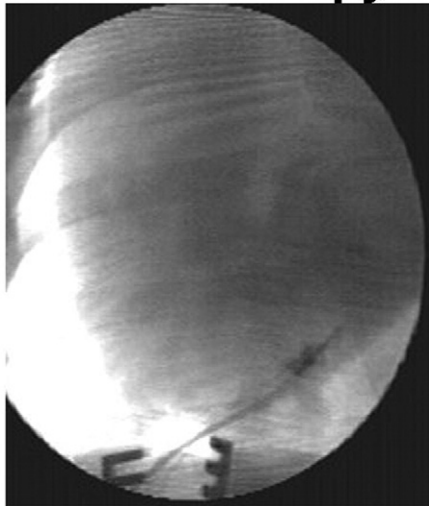
P5. SUBXIPHOID EPICARDIAL PACING LEAD IMPLANTATION USING A MINIATURE CRAWLING ROBOTIC DEVICE. T. Ota¹, N. A. Patronik², D. Schwartzman³, C. N. Riviere², M. A. Zenati¹; ¹The Heart, Lung and Esophageal Surgery Institute, University of Pittsburgh, Pittsburgh, PA, ²The Robotics Institute, Carnegie Mellon University, Pittsburgh, PA, ³Atrial Arrhythmia Center, University of Pittsburgh, Pittsburgh, PA

Background: We have developed a miniature crawling robot (HeartLander) that navigates on the epicardium. We tested the epicardial pacing lead implantation with the fifth generation prototype of the HeartLander using a beating porcine heart accessed through a closed chest subxiphoid approach. **Methods:** HeartLander consists of two articulated modules that adhere to the epicardium using suction and achieve inchworm-like locomotion. The device was inserted into the pericardial space through a subxiphoid approach. Visualization was achieved with an on-board camera and a fluoroscopy. Left ventricular epicardial pacing lead placement was performed through the working port of the robot. The blood pressure and electrocardiogram were monitored. The heart was excised and examined after the test. **Results:** The HeartLander walked on the surface of the heart from the apex to the targeted posterior wall. After being screwed down into the myocardium, the epicardial lead was released from the HeartLander body. The successful placement of the lead was confirmed by fluoroscopy and actual electrical pacing tests (threshold: 0.5mV/0.5ms). The on-board camera provided adequate visualization of intrapericardial landmarks. No adverse hemodynamic or electrophysiologic events were noted during the trial. A histological study of the excised heart verified that no epicardial damage was caused by the locomotion. **Conclusions:** The HeartLander prototype demonstrated successful epicardial pacemaker lead placement on a beating porcine heart through a closed chest subxiphoid approach. This approach may be useful for epicardial left ventricular lead implantation for cardiac resynchronization therapy.

HeartLander



Fluoroscopy



P6. DECORTICATION AFTER LUNG TRANSPLANTATION.

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Purpose: Pleural complications are common after lung transplantation and may compromise allograft function. Lung entrapment resulting from loculated pleural effusion, empyema or fibrothorax is often amenable to surgical decortication. However, obliterated tissue planes and fragility of the transplanted lung make decortication more technically challenging and less predictable in this group. We examined our experience with decortication in lung transplant recipients to characterize pleural pathology, determine the extent of lung re-expansion, and analyze patient outcome. **Methods:** We identified 490 patients in our prospective database that underwent lung transplantation at the Cleveland Clinic between February, 1990 and January, 2006. **Results:** Decortication was performed 20 times in 19 patients (3.9%), a median of 86 days after lung transplant (range 12 to 964days). Suspected empyema was the most common indication for operation (11), followed by loculated effusion (6), hemothorax (2) and fibrothorax (1). Complete re-expansion of the transplanted lung was achieved after 16 of the 20 decortications (80%). The median length of stay was 17.5days (range 3-102) and the operative mortality was 25%. **Conclusions:** Empyema is the most common indication for decortication after lung transplant followed by loculated pleural effusion and hemothorax. While decortication leads to complete expansion of the majority of transplanted lungs, the length of stay is long and mortality high. **Clinical Implications:** Decortication should be used selectively after lung transplantation, weighing the risks of lung entrapment and pleural space infection against considerable operative mortality.

P7. THE COAPSYS® DEVICE PRODUCES A REDUCTION IN MITRAL REGURGITATION AND POSITIVE LEFT VENTRICULAR REMODELING. M. A. Zenati; The Heart, Lung and Esophageal Surgery Institute, University of Pittsburgh, Pittsburgh, PA

Background: The management of patients with heart failure generally focuses on reversing the effects of deleterious left ventricular (LV) remodeling. The Coapsys device is surgically implanted and is designed to treat functional mitral regurgitation (MR) by changing the shape of the mitral annulus and LV. The purpose of this evaluation is to determine if these acute changes in LV shape produce evidence of positive chronic LV remodeling in addition to reductions in the degree of MR from annular modification. **Methods:**

Patients with coronary artery disease, having LV dysfunction and a baseline MR grade ≥ 2 were referred to the Escorts Heart Institute and Research Centre for coronary artery bypass grafting (CABG) and MR correction utilizing the Coapsys device. The evaluation of the device was conducted as part of the TRACE (Treatment of Functional Mitral Regurgitation without Atriotomy or CPB Clinical Evaluation) trial. Patients with structural abnormalities of the valve apparatus were excluded. The Coapsys device, which consists of anterior and posterior epicardial pads connected by a flexible chord, was implanted in patients whose intraoperative MR remained \geq grade 2 after CABG (n=24). The device was sized by drawing the epicardial pads together to effect the desired change in valvular function and ventricular geometry. Detailed echocardiographic data including left ventricular end-diastolic (LVEDD) and end-systolic (LVESD) dimensions, LV length, LV ejection fraction (LVEF) and MR severity, were serially collected out to 1 year after surgery. **Results:** Echocardiographic comparison of baseline and 12 month data for the various geometric parameters measured is displayed in Table 1. MR grade was reduced from 3.0 ± 0.6 at baseline to $1.2^* \pm 1.2$ at 12 months (* $p < 0.05$). LVEDD, LVESD and LV length all showed a reduction and LVEF showed an increase at 12 months after device implantation. **Conclusions:** In patients with functional MR, the Coapsys device leads to significant positive LV remodeling in addition to the expected reduction in MR. This effect of the Coapsys device on LV geometry may be beneficial in reversing the effects of negative LV remodeling.

Table 1,

(* $p < 0.05$ vs. Baseline (n=24))

	Baseline	12 Months
LVEDD (cm)	5.5 \pm 0.6	4.9 \pm 0.6*
LVESD (cm)	4.7 \pm 0.6	4.2 \pm 0.6*
LV Length (cm)	8.5 \pm 0.7	8.2 \pm 0.6*
Ejection Fraction (%)	35.1 \pm 7.0	38.5 \pm 7.6*

P8. PREFERENTIAL EXISTENCE OF DEATH-INDUCING PROTEINS IN THE HUMAN CARDIOMYOPATHIC LEFT VENTRICLE. N. Dzimiri, B. Afrane, C. C. Canver; King Faisal Specialist Hospital & Research Centre, Riyadh, Saudi Arabia

Introduction: The role of genetic make-up in dilated cardiomyopathy (DC) still remains unknown. We investigated the genetic modulation of cardiac apoptotic signaling genes in human DC. **Methods:** Cardiac tissue was obtained from six heart transplant recipients (age = 43 ± 7 yrs) with DC. Equivalent control specimens were taken from six healthy heart donors (age = 33 ± 4 yrs). The mRNA expression of death-inducing proteins, the death (DRs) and decoy receptors (DcRs) in each cardiac chamber was quantified by PCR LightCycler. Immunodetectable receptor protein was measured densitometrically. Data was analyzed by ANOVA and unpaired t-test. **Results:** In DC tissues, DR1 mRNA was elevated by 42.7% ($p < 0.01$) in the left ventricle (LV) and 56.4% ($p < 0.001$) in the left atrium (LA) while DR2 increased by 112.5% ($p < 0.0001$) in LV and 45.8% ($p < 0.05$) in LA. Increase in DR4 was 29.6% ($p < 0.01$) in LV, 82.5% ($p < 0.01$) in the right ventricle (RV), 210.8% ($p < 0.01$) in LA and 99.1% ($p < 0.01$) in the right atrium (RA). DR5 was elevated by 66.7% ($p < 0.01$) in LV, 181.8% ($p < 0.005$) in LA and 90.2% ($p < 0.05$) in RA. DcR1 decreased by 30.8% in LV, 44% ($p < 0.05$) in LA and 12.5% in RA, and DcR3 by 67.1% ($p < 0.0001$) in LV, 82.4% ($p < 0.0001$) in RV, 85.1% ($p < 0.0001$) in LA and 84.6% ($p < 0.0001$) in RA. The trends in mRNA expression were comparable to the changes in protein expression. **Conclusions:** Abundant presence of death-inducing proteins preferentially in the cardiomyopathic LV suggests their potential, yet unexplained, modulatory roles on the apoptotic receptor signaling in the pathogenesis of human end-stage myocardial failure.