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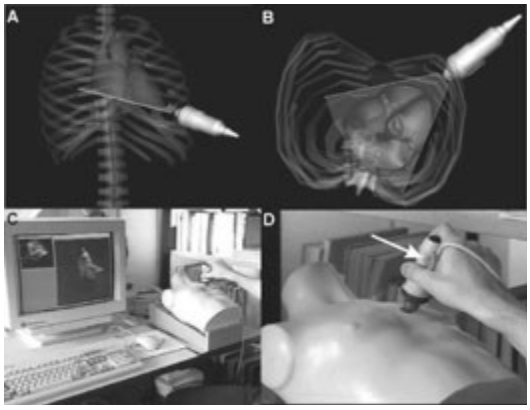
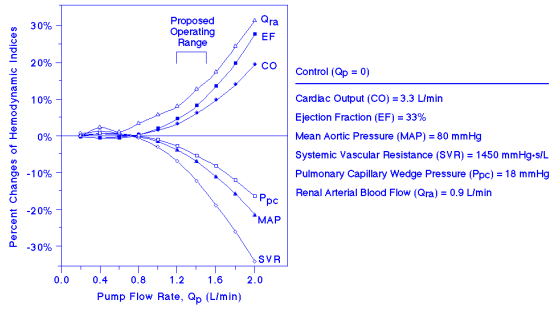
for orientation and guiding. The demonstrator provides an excellent training tool to become acquainted with echocardiography.



1058-69 Modeling and Prediction of Acute Hemodynamic Effects of an Arterial Assist Device

Salvatore A. Chiaramida, Naveen L. Pereira, Michael R. Zile, Christopher D. Nielsen, Adrian B. VanBakel, Donna M. Meyer, Ying Sun, Medical University of South Carolina, Charleston, SC, University of Rhode Island, Kingston, RI

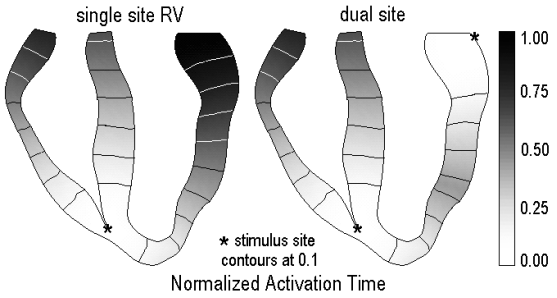
Background: The concept of utilizing an arterial assist device in the form of a femoral-aortic flow pump has been proposed to be of benefit in patients with severe refractory congestive heart failure by reducing afterload and is currently under investigation. Mechanisms for putative improved hemodynamics as suggested in preliminary studies are not well understood. Method: A previously validated computer model is used to simulate hemodynamics and acute effects of the assist pump. The pump is modeled as a constant flow source (Qp) from femoral artery to proximal descending aorta. The pressure head loss in the descending aorta due to outflow velocity (V) is modeled by use of the Bernoulli's equation: (dVV/2)(Qp/CO), where d is density of blood and CO is the intrinsic cardiac output. Result: The control was set for congestive heart failure with hemodynamic indices defined and shown in figure. The model maintained constant preload and intrinsic myocardial contractility, and did not include effects due to change in coronary perfusion. The percent changes of these indices were plotted as Qp varied from 0.2 to 2 L/min. Conclusion: Based on our computer simulation, superimposing an additional constant flow on pulsatile aortic flow produces moderate improvement of hemodynamic indices in the proposed operant range of pump flow (1.2-1.5 L/min). A variety of system parameters could shift this range. Observed increase in renal blood flow and secondary neurohumoral actions could yield additional hemodynamic benefit.



1058-70 Changes in Left Ventricular Activation Sequence in a Finite Element Model of Single Site Right Ventricular and Dual Site Biventricular Pacing

Frederick J. Vetter, Haiyan Sui, Salvatore A. Chiaramida, University of Rhode Island, Kingston, RI, Medical University of South Carolina, Charleston, SC

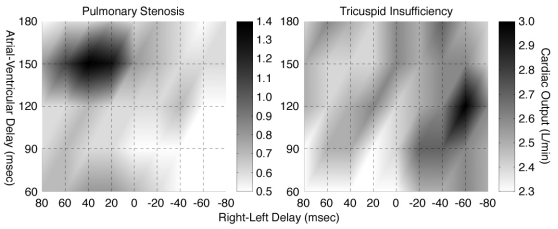
Background: Dual site biventricular pacing, where the left ventricle (LV) is paced with the right ventricle (RV), improves outcome in some heart failure patients. Single site RV pacing may lead to worse outcomes than dual site pacing, which may be related to asynchronous LV activation. **Methods**: A two-dimensional finite element model of a realistic ventricular geometry was used to compute changes in the LV activation sequence using single site RV pacing and dual site biventricular pacing protocols. The RV protocol activated apical cavity nodes to simulate an endocardial lead stimulus. The dual site protocol added a lead in the coronary sinus vein by activating nodes at the base of the LV free wall. The cable equation, governing the spread of excitation, was solved in each case to obtain the activation time of the propagated wave. **Results**: The upper midventricle of the LV free wall was activated 67% earlier with dual site pacing relative to RV pacing; the entire free wall was activated 55% earlier. Dual site pacing showed the activation sequence reversal observed in patients benefiting from biventricular pacing, and more closely resembles normal activation by reducing LV activation asynchrony. **Conclusion**: Realistic simulations showed markedly different LV free wall activation between single site RV and dual site pacing. This tool is useful to investigate how altered activation enhances cardiac output and improves outcome, and may suggest new beneficial pacing strategies. Supported by NCRR-NIH Grant P20 RR 16457.



1058-71 Visualization of the Effect of Atrial-Ventricular and Right-Left Delay on Cardiac Output During Biventricular Pacing

T. Alexander Quinn, David G. Rabkin, Santos E. Cabreriza, Lauren J. Curtis, Henry M. Spotnitz, Columbia University, New York, NY

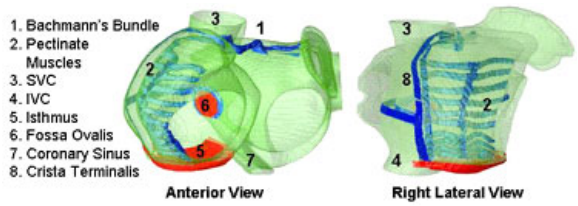
Background: Biventricular pacing (BiVP) has great potential as an adjunctive treatment for patients with acute and chronic heart failure. Acute optimization of BiVP requires determining the appropriate atrial-ventricular delay (AVD) and right-left delay (RLD) on a patient-to-patient basis. Presently there is no good method for optimization of AVD and RLD in BiVP for improved cardiac output (CO), so we therefore examined the utility of CO surface plots for optimization of BiVP.
Methods: In a study of pulmonary stenosis and tricuspid insufficiency in anesthetized pigs with induced heart block, AVD and RLD were varied during BiVP and CO measured using an ultrasonic flow probe. Surface plots displaying CO with variations in AVD and RLD were generated. CO, represented by a red-to-blue color map (the vertical bar), is plotted against varying AVD (60 to 180 msec) on the ordinate and RLD (80 to –80 msec) on the abscissa and linearly interpolated between measured values.
Results: The figure below shows representative CO surface plots during BiVP in a pig with pulmonary stenosis (left) and tricuspid insufficiency (right). (Note: Here the color spectrum is displayed as a gray scale map, with black representing the highest CO). The plots show the optimal settings of AVD and RLD, indicated by the darkest area of the surface.
Conclusion: CO surface plots allow visualization of the effects of AVD and RLD on CO during BiVP. By use of emerging technologies, CO maps may be useful for determining the optimal AVD and RLD settings for BiVP.



1058-72 Computer Model of the Human Atrium as a Study Tool for Atrial Arrhythmias

Carin Siegerman, Marta Vakulenko, Zenaida Feliciano, Alan Garfinkel, UCLA School of Medicine, Los Angeles, CA

Background: Atrial fibrillation (AF) affects 5% of people older than 60 years of age. The design of a successful strategy against AF depends on an understanding of the fundamental mechanisms creating this arrhythmia. An accurate anatomic and electrophysiologic model of the normal atrium is an essential experimental system for the study of AF.
Methods: Our model of the normal human atrium includes fast conducting regions (pectinate muscles, the crista terminalis, superior and inferior interatrial connections), slow conducting regions (isthmus, limbus of fossa ovalis), and the pulmonary veins (Figure). It uses a model of the atrial myocyte that accurately reproduces the human transmembrane potential and the effective refractory period (ERP). Pacing simulations in this model were used to evaluate how closely our model resembles the known human atrial behavior.
Results: The accuracy of the interatrial connections results in simulations of atrial depolarization and refractoriness (ERP ~235 ms) that closely resembles those reported for the human atrium. AF can be induced in this model by cross-field stimulation; this AF is self-terminating, as is also seen in real human atrium.
Conclusion: A mathematical model of the human atrium that resembles human atrial physiology has been developed and may prove to be an indispensable research tool for the study of atrial arrhythmias.



1058-73 **Microsimulation to Support Prosthetic Aortic Valve Selection**

Johanna J.M. Takkenberg, John P.A. Puvimanasinghe, Marinus J.C. Eijkemans, Lex A. van Herwerden, Ewout W. Steyerberg, J. Dik F. Habbema, Ad J.J.C. Bogers, Erasmus MC, Rotterdam, The Netherlands

Background. Prognosis after aortic valve replacement (AVR) is determined by multiple inter-related factors, and objective selection of the preferred valve substitute can be difficult. Standard statistical methods do not allow detailed insight into the factors that affect outcome in the individual patient.
Methods. The use of a microsimulation state-transition model to predict age- and gender-specific outcome is illustrated using meta-analyses on the occurrence of valve-related events and outcome after AVR with different valve substitutes (bileaflet mechanical valves (N=2986), stented bioprostheses (N=5837), allografts (N=629) and autografts (N=380)). The microsimulation model uses the meta-analysis information to generate a large number (10,000) of age and gender-specific life histories of patients after AVR, allowing detailed insight into all probable outcomes after AVR for patients with this specific age and gender. The impact of valve-related events, excess mortality due to heart valve disease, and other non-valve-related events on survival can thus be quantified.
Results. Compared to healthy age-matched people, life expectancy of patients after AVR is markedly reduced, especially at a younger age. For a 40-year-old male patient mean life expectancy after AVR is reduced from 35 to 19-20 years, depending on the type of prosthesis used. This reduction is mainly due to excess mortality (14 years), while valve-related events play a minor role (1-2 years). Reoperation for structural valve deterioration is common in younger patients with tissue valves, causing 4-5% of all deaths for patients aged 40, depending on the type of tissue valve. On the other hand, younger patients with mechanical valves have a high lifetime risk of suffering thrombo-embolic and bleeding events, causing for example 4% of mortality in patients aged 40 years.
Conclusion. Microsimulation allows detailed insight into the factors that affect outcome after AVR. Valve-related events play a minor but important role, since their effect on life expectancy can be minimized by choosing the 'best' valve substitute for the individual patient. In this respect microsimulation is a useful and objective decision support tool.

POSTER SESSION

1077 Quality of Care for Cardiovascular Disease

Monday, March 08, 2004, 9:00 a.m.-11:00 a.m.
Morial Convention Center, Hall G
Presentation Hour: 10:00 a.m.-11:00 a.m.

1077-67 **Guideline-Based Standardized Care Substantially Reduces Mortality in Medicare Patients With Acute Myocardial Infarction: The American College of Cardiology's Guidelines Applied in Practice Program in Michigan**

Kim A. Eagle, Cecelia K. Montoye, Arthur L. Riba, Anthony C. DeFranco, Robert Parrish, Stephen Skorcz, Patricia L. Baker, Benrong Chen, Canopy Roychoudhury, Rajendra H. Mehta, University of Michigan, Ann Arbor, MI

Background: It has been shown that the American College of Cardiology (ACC) Guidelines Applied in Practice (GAP) program improves adherence to key evidenced-based therapies in acute myocardial infarction (AMI), particularly when standardized care tools are used. To assess the impact of GAP on mortality, we studied 30-day and 1-year (yr) mortality in 2857 Medicare Beneficiaries cared for at 33 hospitals in Michigan during the 3 GAP projects.
Methods: We compared baseline features, in-hospital treatments, and outcomes in 1368 patients cared for prior to GAP and 1489 patients treated after GAP. Logistic regression models were built to identify clinical variables predictive of 30 day and 1-yr mortality. We tested effects of the GAP project and the use of standard orders and discharge tool on mortality.
Results: Pre and post GAP patients were similar in demographics, clinical presentation, co-morbidities and complications. Multivariate predictors of mortality were old age, heart failure, increased heart rate, chest pain, atrial fib, MI location, anemia, LVEF, troponin level, and PCI /CABG: 0.76 C-statistic. Both GAP and use of standardized care tools were associated with significantly lower 30 day and 1-yr mortality.
Conclusions: The ACC AMI GAP program is associated with a reduced 30-day and 1-yr mortality among Medicare Beneficiaries. This independent and substantial mortality reduction is realized in patients who receive system-based care with standard, guideline-based orders and/or discharge tools.

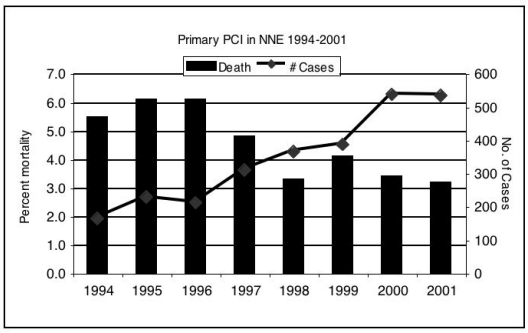
In-hospital, 30 day and 1-year Mortality Rates

	GAP	No GAP	p value	Odds Ratio	Care Tools	No Tools	p value	Odds Ratio
In hospital	10.7%	13.6%	0.017	-------	8.7%	13.1%	0.0009	------
30 day	16.7%	21.6%	0.001	1.35 (CI 1.07-1.70)	13.6%	22.4%	<0.0001	1.73 (CI 1.27-2.35)
1 year	33.2%	38.3%	0.004	1.28 (CI 1.06-1.56)	29.3%	40.7%	<0.0001	1.39 (CI 1.08-1.80)

1077-68 **Decreasing Mortality in Primary Percutaneous Coronary Intervention in Northern New England Is Related to Efforts at Regional Quality Improvement**

Theodore Silver, Mirle Kellett, Jr., Winthrop Piper, Michael Hearne, Peter VerLee, Thomas Wharton, John Robb, Matthew Watkins, David Malenka, for the Northern New England Cardiovascular Disease Study Group, Dartmouth-Hitchcock Medical Center, Lebanon, NH

Background: Primary PCI has become the treatment of choice for STEMI and a focus of quality improvement efforts (e.g., early recognition, decreased door-to-balloon time) in Northern New England hospitals. We hypothesized that these efforts would be temporally associated with lower inhospital mortality for this patient population.
Methods: We studied 3,013 consecutive cases of primary PCI contributed by 8 hospitals to the Northern New England PCI Registry from 1994 to 2001 to assess changes in case-mix and inhospital mortality.
Results: Over the study period annual caseload increased from 165 to 535 (Figure). Case-mix remained stable over time. Crude mortality declined significantly from 6.1% to 3.2% (ptrend=0.01), as did adjusted mortality (ptrend<0.01), and was observed at all institutions. The declining mortality was seen across patient subsets including those over age 70 (ptrend=0.02), women (ptrend=0.08), those with left main disease (ptrend=0.01), and in patients with multivessel disease (p=0.10).
Conclusion: Since 1994 regional mortality associated with primary PCI has decreased by 48%. While likely multifactorial, it was clearly concurrent with regional efforts at quality improvement.



1077-69 **Underutilization of Effective Treatement in Diabetic Patients Admitted With Acute Myocardial Infarction**

Dennis T. Ko, Alice M. Newman, Douglas S. Lee, Peter C. Austin, Linda R. Donovan, Jack V. Tu, Sunnybrook and Women's College Health Sciences Center, Toronto, ON, Canada, Institute for Clinical Evaluative Sciences, Toronto, ON, Canada

Background
Diabetic patients suffering acute myocardial infarction (AMI) have significantly higher mortality compared with non-diabetic patients. While it has been demonstrated that thrombolytics are underused in diabetic patients, it is unclear whether other effective therapies are also underutilized.
Methods
We analyzed the Enhanced Feedback for Effective Cardiac Treatment (EFFECT) database, an initiative to improve care that collected information for patients admitted with an AMI in Ontario, Canada during 1999 to 2001.
Results
There were 7,207 AMI patients, 25% had diabetes and 75% did not. Diabetic AMI patients were significantly older (71 vs 68 years), more likely to be female (41% vs 34%), had higher likelihood of comorbid conditions, and had higher adjusted mortality at 30-days (14% vs 11%). Among ideal candidates, aspirin and beta blockers were prescribed less often both on admission and at discharge in diabetics. However, ACE inhibitors were prescribed more often compared with non-diabetics at discharge. (Table)
Conclusions
Despite higher risk of death, life-saving therapies such as aspirin and beta blockers are substantially underutilized in diabetic patients with AMI. Improving the quality of care in