Tuesday, March 5, 1991
Poster Displayed: 2:00PM–5:00PM
Hall F, West Concourse

DIGITAL SUBSTRACTION MYOCARDIAL CONTRAST ECHOCARDIOGRAPHY: A PROGRAM FOR PERFUSION MAPPING AND ANALYSIS.

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On line computation of perfusion in the clinical settings based on myocardial contrast echocardiography (MCE) is presented. An IBM PC compatible program that acquires ECG R wave gated images, and calculates the myocardial washout curve with its intensity, time and area parameters, and allows for automatic mapping of the entire image for perfusion was developed. The program performs washout calculations for multiple angular regions of interest, as well as automatic scanning and mapping of washout parameters for the entire image with color coded display of the desired parameter. The program was tested in 6 anesthetized, open chest, dogs with left anterior descending (LAD) artery snare, imaged by an Aloca system using left atrial injections of sonicated albumin for baseline, LAD ligation, and reactive hyperemia conditions. The maps of perfusion during ischemia and hyperemia matched the LAD region with a corresponding change in the color coded intensity level. The integrated, baseline substracted, intensity time area decreased after occlusion and increased during hyperemia as compared to baseline (42±33% AND 171±50% respectively, $p<0.05$), and thus reflects local myocardial perfusion. The new software of digital substraction MCE is thus capable of on-line automatic analysis with color coded display of the perfusion image as well as quantitave regional perfusion analysis and therefore provides the physician with a clinical tool for objective analysis of myocardial perfusion.

TEMPERATURE CONTROL BY COMPUTER FEEDBACK LOOP DURING THERMAL CATHETER UTILIZATION

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Simple "on–off" temperature control for thermal catheter atherectomy results in imprecise and dangerous energy application, while manually driven control is cumbersome with slow response times. A computer driven temperature control system was developed to address these problems. A laptop 286 PC computer fitted with an IEEE–488 interface card was connected via an IEEE–488 bus to a compatible power supply and multimeter which supplied and controlled electrical energy to the catheter tip. A microthermocouple measured temperature at the catheter tip. The control program was written in Turbo Pascal on a system equipped with MS DOS 4.01.

Catheter temperature may be sampled and adjusted up to 20 times per second. The desired working temperature is entered on the computer keyboard and automatically compared with tip temperature to calculate the error temperature. The program determines from the error temperature what the supplied energy should be. This program rapidly cycles to allow achievement of desired tip temperature over a range of 50–180°C ± 10°C within 12 sec. The rate of rise of temperature is determined by adjustable constants most suited to the working medium.

This system has been proven functional in air, fluid, and solid media, and appears to be an excellent alternative to existing techniques.

Wednesday, March 6, 1991
Poster Displayed: 9:00AM–12:00NOON
Hall F, West Concourse

PREDICTION OF RETURN TO WORK AFTER MYOCARDIAL INFARCTION: DISCRIMINANT ANALYSIS VERSUS THE ARTIFICIAL NEURAL NETWORK APPROACH.

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In this study the outcome of 4 different methods predicting return to work (RTW) after myocardial infarction (MI) were compared. Six demographic, 3 medical and 11 psychological variables were collected from 150 males 3 month after MI. All patients worked before MI. For analyzing purpose 2 subgroups (A: 100 Pts and B: 50 Pts) were created by randomization. Group A and B did not show statistical differences on any variable.
These 4 different methods were used to predict RTW one year after MI. The first method (DA1) was based on the classical discriminant analysis using a non-parametric method to derive the classification criterion. Posterior classifications were computed on group A. Predictive calculation was performed on group B. Only 3 out of 11 psychological variables measured could be used for reasons of multicollinearity.
In methods NN1, NN2 and NN3 an artificial neural network was trained with data of group A and tested using group B. In NN1 the same data as in DA1 were applied. In NN2 all 11 psychological variables were used, while in NN3 the learning process was maximally optimized and prolonged to obtain the best possible prediction.

RESULTS		DA1	NN1	NN2	NN3
Correctly predicted:	Group A:	100%	97%	100%	100%
	Group B:	62%	62%	76%	84%

Conclusion: RTW could be predicted significantly better by selecting a neural network approach.

PACKAGE FOR COMPUTING THE MULTIFACTORIAL RECEIVER OPERATOR CHARACTERISTICS

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Retrospective investigations of patients at high risk of cardiac complications need to evaluate multivariate sets of clinical data recorded in large patient populations. In order to serve such evaluation, a computer package has been developed which calculates the Receiver Operator Characteristic (ROC) curves for various subsets of the stratification factors. The package inputs the values of stratifications factors of all patients in the analysed population and the specification of the 'positive' patients who suffered cardiac complications. In an interactive mode, the user of the package then selects different combinations of stratification factors and for each such combination, the ROC curve is computed. The package uses the following algorithm. Each patient p is characterised by a set of values $(a_i^p)_{i=1}^N$ corresponding to N different factors. The ROC curve corresponding to these N factors is computed by identifying the sets of patients q, such that $m_i < a_i^q < M_i$, (for $i=1,\ldots,N$), where m_i and M_i are variable stratification limits. By changing these limits, the package approximates the set of positive patients in different ways and obtains different values of sensitivity and specificity for each approximation. Based on these pairs of sensitivity and specificity values, the ROC curve is computed. Special algorithmical features reduce the computational complexity of varying the limits m_i and M_i, but the computation of the curve for several factors on a continuous scale can take several hours. The package is being used in studies stratifying patients at high risk of complications after myocardial infarction.