

Wednesday, March 6, 1991
4:00PM-5:00PM, Room 314, East Concourse
Cardiac Pacing

4:00

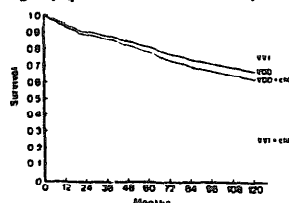
EFFECTS OF ATRIAL SYNCHRONOUS PACING ON SURVIVAL IN PATIENTS WITH HIGH DEGREE AV-BLOCK AND CONGESTIVE HEART FAILURE.

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Patients with fixed rate ventricular pacing (VVI) have a higher cardiac sympathetic activity compared to patients with rate-responsive pacemakers. A high sympathetic activity has been shown to be unfavourable for patients with congestive heart failure (CHF). VVI-pacing may thus adversely affect the vital prognosis for patients with CHF. We studied whether rate-variable pacing may improve the prognosis for such patients.

Method: To test this hypothesis 74 patients treated with atrial synchronous (VDD) and 74 patients treated with VVI-pacemakers for complete heart block were followed for a median of 5.3 years (range=1 day-10.8 years) by Cox's regression analysis. The two groups had an equal distribution of age, sex and date of pacemaker implantation.

Results: The cardiovascular mortality at 5 years did not differ between groups. 42 patients (18 in the VDD-group and 24 in the VVI-group) had CHF either preceding the AV-block or as a presenting symptom at the time of pacemaker implantation. The five year estimated cardiovascular mortality for these patients was 20% in the VDD-group and 50% in the VVI-group ($p < 0.05$, multivariate analysis).



Conclusion: VDD pacing improves the vital prognosis of patients with complete heart block and congestive heart failure compared to fixed rate ventricular pacing. The results should affect the choice of pacing mode for patients with complete heart block and congestive heart failure.

4:15

LONG-TERM FOLLOW-UP OF A RATE-VARIABLE PACEMAKER CONTROLLED BY CENTRAL VENOUS OXYGEN SATURATION

Svein Faerestrland, Ole-Jorgen Ohm. University School of Medicine, Bergen, Norway

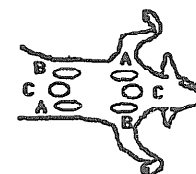
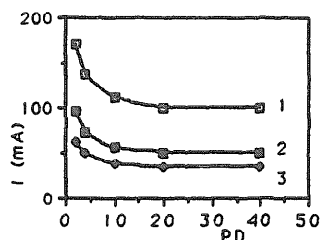
A pacemaker (PM) responding to central venous oxygen saturation (O₂Sat) was studied in 11 patients (Pts) with atrioventricular block, and 3 Pts with atrial fibrillation (mean age, 71 years). The average follow-up period was 15 months (range 0.5-27 months). Every 4th QRS complex a sensor in the PM lead near its tip in the RV emits red and infrared light. The measured intensity of reflected light regulates the PM rate, and can be transferred via telemetry to a PM programmer and to an on-line computer calculating the O₂Sat 50 times a minute. During graded bicycle exercise tests, the O₂Sat decreased and the PM rate increased progressively to a maximum average of 116 bpm (range 89-150 bpm). Holter recordings demonstrated a maximum PM rate average of 116 bpm (range 97-125 bpm). Oxygen breathing 8 l/min for 5 minutes resulted in an average increase of 20% in O₂Sat. In one Pt the PM was explanted after 2 weeks follow-up because of a persisting high PM rate at rest. No sensor dysfunction was discovered during technical tests, and animal reimplantation has shown normal function. In one Pt the O₂Sat decreased from 64% to 34% and the PM rate at rest increased from 60 bpm to 110 bpm during pneumonia, and returned to baseline after recovery. Invasive studies after 1 year follow-up (N=8) demonstrated an average reduction in O₂Sat during bicycle arm exercise of 22±2% in blood samples from RV, 25±2% telemetered from the pacemaker lead in the RV, and 27±2% in the PA.

4:30

Multiple External Pacing Electrode Summation in Dogs

Cliff A. Alferness, Anthony S. Tang, Dennis L. Rollins, Jenny L. Hagler, Raymond E. Ideker, Duke University, Durham, N.C.

External transcutaneous pacing is often considered uncomfortable by conscious patients due to skeletal muscle and cutaneous nerve stimulation. Because the degree of discomfort is related to the current density under the electrodes, efforts to decrease this tissue current density are worthwhile. Based on observations from a previous mapping study, we investigated the summation of equal currents from 3 separately isolated stimulation sources applied to the anterior surface of 12 dogs. These sources were applied from right upper to left lower (A), left upper to right lower (B), and suprasternal to epigastric (C) regions. Strength-duration curves for pulse durations (PD) from 2 to 40 ms were constructed for the mean of all individual electrode pairs (1) mean of all combinations of 2 electrode pairs (2) and mean of all 3 electrode pairs simultaneously (3).



Two sources reduced the individual currents to approximately 1/2 and three sources reduced them to approximately 1/3 of the current required for a single pair of electrodes. Thus, the current density in the tissues under each of the three electrodes was substantially reduced. This substantial reduction in tissue current density may be reflected in better tolerance of external pacing in humans.

4:45

IMPROVEMENT IN CIRCADIAN BLOOD PRESSURE VARIABILITY WITH PHYSIOLOGICAL PACING

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Diurnal variation of blood pressure is a characteristic of the intact cardiovascular system. We assess the circadian BP in 10 Pts with activity sensing dual chamber rate adaptive pacemakers (DDDR, Synergist II, Medtronic Inc), which also can be programmed to the dual chamber mode (DDD), and to ventricular pacing mode at a constant rate (VI at 70 bpm) or with activity-initiated rate adaptation (VVIR). The mean age of the Pts was 55 (range 28-76) yrs and all had complete heart block. 24-hour BP was recorded noninvasively at half-hourly interval with an ambulatory BP recorder (ABPM-630, Colin Medical Instrument) after the Pts had been in each mode for at least 1 week. The pacing rate (in bpm), the systolic (SBP), diastolic (DBP) and mean BP (MBP) in mmHg are:

	DDDR	DDD	VVIR	VI
Rate-maximum	118±4	116±4	122±3	80±2*
mean	70±1	73±3	76±1	74±1
minimum	56±3	56±3	70±1*	70±1*
SBP	130±7	128±6	115±3*	118±4*
MBP	98±6	97±5	91±3	91±3
DBP	70±3	73±3	68±3*	68±2*

* $p < 0.05$ compared with DDD mode

A cosine curve with a period of 24 hour was used to describe the circadian characteristics using the COSINA fitting program. Significant circadian variation was observed most often in DDDR or DDD mode (8 Pts; VVIR 6 Pts; VI 6 Pts). The amplitudes of variation from baseline in DDDR, DDD, VVIR and VI modes were 10.6±2.6, 10.5±2.8, 7.5±1.1 and 6.9±1.6 respectively.

CONCLUSION: DDDR and DDD gave the best circadian variation in rate and BP (especially with decreases at night). This may contribute to better symptomatology in these modes.