POSTER 2

DYNAMIC AV DELAY AND QUALITY OF LIFE (MULTICENTER STUDY GROUP)

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Purpose: the aim of this study is to evaluate if a particular class of patients may obtain an improvement of quality of life thanks to a dynamic configuration of the AV delay.

Materials and methods: 55 patients from 16 centers have been implanted with VDD and DDD pacemakers (Millennium, Medico S.p.A.). These patients, 35 male, 20 female, 75 ± 6 years old, were affected by AV block with regular activity of the SA node and adequate chronotropic response. The protocol contemplates 3 follow up: 4 weeks, 12 weeks and 24 weeks after the implant; two different configurations of the AV delay have been programmed, fixed and rate adaptive. These settings have been evaluated, over 3 months periods, by processing pacemaker diagnostic data, quality of life questionnaire answers and, in selected patients, ergonomic stress test results.

Results: 5 patients have been excluded from the study because of the onset of atrial fibrillation. The patient's life style has been evaluated carefully: 21% sedentary, 19% normal, 54% active, 6% very active. 52% of the patients showed an improvement of their general conditions during the period with the dynamic AV delay configuration, the 22% showed a worsening, the 26% did not reveal substantial variations. Considering only the active patients, with a real chronotropic increase monitored by holter data, the percentages become 63%, 23% and 14% respectively.

Conclusions: the AV delay shortening algorithm gives rise to a haemodynamic improvement largely discussed and demonstrated. In this multicentre study experience, in which patient feelings and quality of life are taken into account too, the benefit is confirmed for the majority of patients enrolled.

EVALUATION OF A NEW ACTIVE CAPTURE CONTROL ALGORITHM BASED ON EVOKED RESPONSE MORPHOLOGY DISCRIMINATION

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In order to minimize battery energy consumption and maximize patient safety, the active capture control (ACC) feature analyzes the ventricular signal quality, automatically determines the ventricular pacing threshold, and provides beat-to-beat capture verification.

Within a European multicenter investigation of a new Philos II DR pacemaker (Biotronik, Germany), we assessed the accuracy of pacing threshold determination by an ACC algorithm evaluating morphology (several parameters) of the evoked response signal in order to differentiate capture from non-capture.

Pacing threshold at 0.4 ms was determined in 102 measurements by ACC and manually at the discharge follow-up in 93 patients (22 undergoing pacemaker replacement). The threshold was measured in steps of 0.1V. The test was performed with 17 different lead models (14 passive and 3 active fixation) from 6 manufactures.

The measured values for the two methods are compared in table (UNI = unipolar, BIP = bipolar configuration).

Pacing Threshold	Manual UNI, n=36	ACC
UNI, n=36	Manual BIP, n=66	ACC
BIP, n=66		
Mean ± SD		

Range	0.7 ± 0.4
0.2 to 2.4	0.7 ± 0.4
0.2 to 2.3	0.5 ± 0.45
0.1 to 3.1	0.5 ± 0.4
0.2 to 2.9	

The intrapatient difference between pacing thresholds for ACC and manual measurements was 0.05 ± 0.08 V (mean ± SD). No difference between the two methods was observed in 67 (65.7%) paired measurements, the difference was 0.1 V in 28 (27.5%) measurements, 0.2 V in 4 (3.9%) measurements, 0.3 V in two measurements (2%), and 0.5 V in a patient with high threshold during a unipolar measurement. The use of a nominal safety margin of 0.5 V was sufficient to maintain patient safety.

In conclusion, the studied ACC algorithm provides accurate threshold measurements in either lead configuration.

IMPEDANCE CARDIOGRAPHY FOR VV INTERVAL OPTIMIZATION IN PATIENTS WITH VENTRICULAR RESYNCHRONIZATION

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INTRODUCTION: Cardiac resynchronization improves cardiac function in patients with cardiomyopathy and atrio-biventricular desynchrony. In addition to conventional AV time optimization, newer devices allow further programmability of interventricular activation, known as V-V offset time. Objectives: to determine the effect of changing left ventricular to right ventricular (VV) pacing interval on cardiac output (CO). Non-invasive impedance cardiography is used to assess CO change. PATIENTS: fourteen patients were evaluated, 12 men, mean age of 61 +/- 10 years, dilated cardiomyopathy, mean ejection fraction 24%, intra-ventricular conduction disturbances and heart failure, New York Heart Association functional class III or IV. All patients had biventricular pacemaker/defibrillator with programmable VV interval. Implant were performed mean 21 days(SD+/-35 days) before the study time. **METHODS**: The optimal AV delay was estimated and programmed based on transmitral flow pulsed Doppler using the method previously described by Ritter. Subsequently, cardiac output (CO), cardiac index and stroke volume were determined by impedance cardiography for different V-V intervals. CO is estimated, beginning at zero msec VV interval, then –20 msec LV to RV, and then –40 msec LV to RV for the same patient. Pacing was maintained for 10 minutes in each pacing mode Results: 3 patients had maximum CO at zero msec VV interval, 5 pts at -20 msec V-V interval and 6 pts at -40 msec of VV interval. This will translate into a mean increment of 0.6 letter/minute (0 -1.1 l/m), equivalent to 30% increase of CO, p<0.05.

CONCLUSIONS: CO with ventricular resynchronization therapy can be further fine-tuned with VV interval optimization in top of the conventional AV optimization. These assessments can be performed rapidly and non-invasively with use of impedance cardiography.

UNDERDETECTION OF ATRIAL FLUTTER IN CARDIAC RESYNCHRONIZATION DEVICES

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BACKGROUND: Atrial tachyarrhythmias (AT) are frequently observed in pts with congestive heart failure (HF). Cardiac resynchronisation therapy (CRT) may help reducing AT by improving global hemodynamic performance. Occurrence of AT requires immediate

mode-switch (MS) to a non-atrial tracking mode. PATIENTS: Seven pts (6 M, age 60±11 y) with CRT devices (four InSync III, two Contak TR, one InSync Marquis) were admitted to our institution on emergency. The automatic MS feature was programmed on in all pts. Underlying heart disease was ischemic (N=3) and idiopathic cardiomyopathy (N=4), LVEF was 25±8%. Four pts had a history of atrial fibrillation. All pts were on optimal medical treatment including ACE-I, BB (N=6), digitalis (N=5) and amiodarone (N=4). RESULTS: In all 7 pts rapid tracking of AT down to the ventricle caused worsening of HF. The ECG showed AT with paced QRS complexes at the programmed upper tracking rate (129±7/min) in 6 pts and sensed ventricular beats (120/min) with CRT-D. Device interrogation revealed atrial flutter (CL 250±25ms) with F-waves occurring during the atrial blanking (PVAB 134±39, range 80-180ms) or refractory periods (PVARP 264±26, range 250-310ms). MS failure (detection rate 148±17, range 130-180/min) was noted in 6 pts and interruption of CRT in one. Reprogramming was performed as acute measure. AT was managed by cardioversion (N=3), overdrive stimulation (N=1), flutter ablation (N=1) and drug administration. CONCLUSION: Underdetection of AT may result in sustained rapid ventricular pacing and deterioration of HF in pts with CRT. The interplay between pacemaker refractory/blanking periods and the atrial flutter cycle length provides the substrate for malrecognition of this regular tachycardia. Pts presenting with dyspnoe and palpitations should undergo immediate device interrogation for potential MS failure.

EFFECTS OF LATEST DEPOLARIZATION BIVENTRICULAR PACING ON THE ACUTELY INFARCTED SWINE HEART

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Introduction: Cardiac resynchronization therapy (CRT) has been shown to be beneficial in patients with symptomatic heart failure (HF) often initiated by infarction. We hypothesized that acute epicardial biventricular (biv) pacing with the LV lead placed at the site of latest depolarization in acutely infarcted hearts will result in optimal electromechanical activation compared to single-site RV pacing. Methods: Non-contact mapping (NCM) was used to record endocardial electrical activity in anesthetized swine, both with and without LAD occlusion. Hearts were paced prior to LAD occlusion, immediately following reperfusion, and three hours after reperfusion. Single-site pacing was performed endocardially from the right atrial appendage (RAA-Intrinsic), RV outflow tract (RVOT), and RV apex (RVA). Biventricular pacing was performed with the left ventricular lead implanted epicardially at the site of latest depolarization as determined by NCM. Millar pressure catheters and sonomicrometry were used to collect LV pressure and volume related data, respectively. All hemodynamic and NCM data were collected after 5 minutes of consistent pacing. **Results**: Prior to LAD occlusion, both biv and single-site pacing were found to be detrimental. QRS duration, -dP/dtmax, as well as minimum LV pressure were all increased, showing electrical and hemodynamic dysfunction. Comparing single-site to biv at time points following infarction, biv resulted in noticeably shorter QRS durations, decreased minimum LV pressures, raised +dP/dtmax, and lower -dP/dtmax. End-diastolic LV pressure (EDLVP) was also increased compared to single-site pacing. Biv pacing produced improved stroke work compared to the unpaced and single-site paced post-infarct hearts. Looking at endocardial electrical activity, single site pacing produced a single LV breakout and one activation wavefront which progressed similarly to intrinsic rhythm. Biventricular pacing resulted in two breakout points and two wavefronts which progressed towards the apex, fused, then terminated septally on the posterior surface of the heart. Conclusions: In this study, biv pacing

improved measures of compliance (+dP/dtmax, -dP/dtmax) as well as measures of systolic function (EDLVP), when compared to single-site pacing.

EVALUATION OF CONTRACTION PATTERN IN BIVENTRICULAR PACING BY RADIONUCLIDE VENTRICULOGRAPHY

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Biventricular pacing (BV) is a well established therapy for cronic heart failure(CHF). Some patients show good response (R) whereas others are non responders (NR). The aim of the study is the evaluation on effective resinchronization obtained by biventricluar pacing **Methods**: patients in sinus rythm and spontaneus AV conduction were evaluated 6 months after BV. In the same day was acquired a radionuclide angiography (RNA)during effective BV (BVon). The device was then reporgrammed to a long AV delay to maintain a spontaneous AV conduction (BVoff) and 3 to 4 hour later a new RNA was acquired. The contraction pattern was evaluated by phase analysis and regional ejection fraction (REF). Patients were classified as R if NYHA class was reduced at least of 1 class and if in the follow-up time patient were not readmitted for CHF.
Results: R showed a significant difference in REF during BVon and in the phase analysis pattern

EVALUATION OF DIASTOLIC FUNCTION IN CARDIAC RESYNCHRONIZATION THERAPY

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Background. Cardiac resynchronization therapy (CRT) improves quality of life (QoL) and cardiac performance in patients (pts) with severe ventricular dysfunction (SVD). These pts have diastolic dysfunction (DD), due to ventricular stiffness. Aim of our study: to evaluate the effects of CRT on DD.
Methods. 21 pts (16 males; mean age 72) with SVD (FE<0.35; NYHA class>3), underwent to biventricular-pacing. We evaluated clinical, electrocardiographic, and echocardiographic data, particularly EA ratio, deceleration time (DT) and SD ratio, to classify DD as mild, moderate or severe (baseline and at a mean follow-up -FU- of 188 days). All pts had DD at baseline. Two groups were identified: improvement (A) or not (B) of the DD.
Results. 8 patients (28%) improved DD. In both groups, CRT induced significative decrease of NYHA class (A 3.4 vs 2.1; p<0.01; B 3.5 vs 2.1; p<0.01) and significative improvement of QoL (decrease Minnesota, A 51 vs 31; p=0.03; B 56 vs 27; p<0.001). In both groups we observed significative reduction of QRS (A 198 ms vs 136 ms; p<0.001; B 187 ms vs 162 ms; p=0.046) and significative increase of ejection fraction (EF; A 0.26 vs 0.37; p=0.02; B 0.27 vs 0.34; p=0.03).
In pts with improvement of DD, QRS was significantly shorter during FU (A 136 ms, B 162; p=0.03); they had a greater decrease of QRS (A 62ms, B 24ms; p=0.01) and of left ventricular-end-diastolic-volume (LVEDV; A 54ml, B -13ml; p<0.001). None of baseline parameters identified DD improvement. The DT at FU was not correlated with resynchronization parameters.
Conclusions. In our study, 28% of pts had an improvement of DD. This was not correlated with resynchronization parameters, but with greater decrease in the QRS interval.

SHORT-TERM EFFECT OF OPTIMAL A-V DELAY OF PATIENTS LIVING WITH ATRIO-BIVENTRICULAR PACEMAKER

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Development of pacemaker technology permitted biventricular stimulation that has a prominent role in non-pharmacological therapy in cardiac failure by literary data.

The aim of our study was to examine the changes in hemodynamic states caused by different settings of atrio - ventricular delay during atrio-biventricular stimulation.

Materials and methods: Since 2001 in 14 patients (2 females, 12 males, mean age 63±6,4 years) were implanted with pacemaker producing cardiac resynchronisation. All of our patients had decreased ventricular ejection fraction (25±4,2%) and normal sinus node function and left bundle branch block. The hemodinamic state was monitored in rest by thoracic electric bioimpedance developed by ASKit Company (ICG 501 Compact). After setting the optimal basic rate measurements were performed in biventricular stimulation (BiV) with dynamic AV delay 75, 100, 120, 140 ms. BiV stimulation with 150 ms AVD was compared with BiV and A-V sequential right ventricular stimulation. Data analysis of relevant parameters cardiac index (CI), stroke volume index, (SVI) systemic vascular resistance (SVR) was performed. Mathematical analysis was performed with paired student test.

Results: During the follow up 3 patients died, two of them in progressive heart failure, one of them in malignant arrhythmia. The increase of SVI was significant in BiV stimulation with 75 ms AVD (p=0,01) and in A-V sequential right ventricular stimulation with AVD 100, 120, 140 ms (p<0,005).

Summary: According to our study it seems that different settings of AVD did not result significant hemodynamic advantage in short-term follow-up period. To clarify the importance of AVD in the long-term well being of patients caused by atrio-biventricular stimulation needs further examination. To reach the optimal ventricular filling individual dynamic AVD has to be set.

BIVENTRICULAR PACING IN PATIENTS WITH ADVANCED HEART FAILURE: SINGLE CENTER EXPERIENCE

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Introduction: Biventricular pacing (BIV) in selected patients with congestive heart failure (CHF) has reached increasing acceptance.

The aim of the study is to describe the clinical outcome in the group of pts treated with BIV pacing in our center.

Material and methods: The study population consisted of 22 pts successfully implanted with biventricular pacemaker (8 of them with BIV-ICD) with min. follow-up duration 3 months. Follow-up evaluation included clinical status, pacing conditions, QRS duration and echocardiographic examination.

Results: In the mean follow-up of 20,2 ± 12 months the clinical improvement was observed, as demonstrated by the reduction in the NYHA class (from 2,9± 0.5 before implant to 2.4± 0.5, 2,1± 0,6 and 2,1± 0,6 within 3, 6, 12 months respectively). Distance covered during 6 minute walking test increased from 323 ± 140 before implant to 384± 164, 459± 176 and 459± 134 within 3, 6, 12 months respectively. 6 pts required hospitalization due to worsening of heart failure symptoms (in 3 of them loss of ventricular synchronization occurred). The number of hospitalization required one year prior procedure decreased from an average of 21, 3 ± 23, 31 to 2, 8± 6, 21 and 9, 25± 15, 1 at one and second year post procedure. 2 pts underwent heart transplant. One pt died because of CHF progression 26 months after implantation.

Conclusions: Biventricular pacing improves clinical status and exercise tolerance in pts with severe CHF. Biventricular pacing reduces the number of hospitalization due to worsening of heart failure symptoms.

COMPLICATIONS RELATED TO CORONARY SINUS LEAD IMPLANTATION FOR PERMANENT BIVENTRICULAR PACING IN PATIENTS WITH SEVERE HEART FAILURE

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Introduction: Biventricular pacing (BIV) has been recently proposed as a new therapeutic approach in selected patients with advanced heart failure (CHF). One of the technical difficulties of this therapy is to achieve effective and safe permanent left ventricular (LV) pacing. The aim of study was to analise technical problems and complications related to transvenous LV lead implantation in coronary sinus (CS) tributaries in patients treated with BIV pacing in our center.

Material and methods: LV lead implantation was attempted in 39 patients with advanced dilated cardiomyopathy (NYHA class 2,9± 0,5, QRS duration 171± 32ms and LVEF 24± 5%). 18 pts were eligible for BIV-ICD implantation.

Results: During implantation in 12 pts (31%) LV lead related problems occured: inability to cannulate CS (7), inability to obtain stable lead location in a coronary vein (4), high LV pacing threshold and phrenic nerve stimulation (1). One of these pts was reoperated and LV endocardial pacing was achieved with the LV lead introduced transseptally. In 27 pts the LV pacing was successfully obtained via the CS tributaries. overall implantation success rate was 71%. In the perioperative period complications were observed in 9 pts (LV lead dislodgment (3), LV exit block (4), proarrhythmic effect (1), infection (1))and 5 pts were successfully reoperated. During mean follow-up of 16±14 months 1 pt required reoperation due to an increase in the BiV pacing threshold (>7, 2V/1,0 ms).

Conclusions: 1) Technical difficulties with CS lead positioning are the main cause of failure to implant the BiV system; 2) Complications are likely to occur during perioperative period. 3) BiV pacing is accompanied by high rate of complications and required reoperations.

CARDIAC RESYNCHRONIZATION IMPROVES THE MECHANICAL PERFORMANCE OF THE RIGHT VENTRICLE

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Background: Cardiac resynchronization therapy (CRT) is known to improve the systolic function of the left ventricle. Many patients with systolic left heart failure also suffer from symptoms of right heart failure. The effects of CRT on right ventricular (RV) performance is unknown.

Methods: Right ventricular function was evaluated echocardiographically in patients undergoing CRT system implantation before, and during biventricular pacing. We have calculated the RV myocardial performance index (RVMPI) by dividing the sum of RV isovolumic relaxation time and isovolumic contraction time by the ejection time.

Values below 0.5 are considered as normal. Lower values signify better systolic function of the RV.

Results: Overall 17 patients (15 male) all with ischemic dilated cardiomyopathy and CLBBB (N = 14), or permanent right ventricular pacing (N = 3) were included. The mean age at implantation was 72 ± 9, mean LVEF 24 ± 5, and mean native QRS width 174 ± 43. Mean RVMPI before implantation was 0.73 ± 0.40, and improved to 0.53 ± 0.24 during biventricular pacing (p = 0.038).

Conclusions: CRT is associated with improved systolic function of the right ventricle.

THE BENEFIT OF BIVENTRICULAR PACING ON GLUCOSE METABOLISM, PERFUSION AND WALL THICKENING ASSESSED BY

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Cardiac resynchronization therapy is effective in patients with severe congestive heart failure. It has been known that the therapy improves asynchronous contraction, decreases pulmonary capillary wedge pressure, and reduces mitral regurgitation. Purpose: The purpose of this study is to investigate the effects of biventricular pacing on glucose metabolism, wall thickening, perfusion, left ventricular ejection fraction(LVEF) and end diastolic volume(EDV) with FDG-gated PET(gated PET) and 99m Tc-MIBI(MIBI) gated SPECT. Methods: Eight patients who had implanted biventricular pacemaker underwent glucose loading gated PET and MIBI gated SPECT. They were followed up with gated PET and MIBI gated SPECT. Results: The 4 subjects improved LVEF more than 5% in first examination (Group A). The other is Group B; LVEF increased less than 5% or decreased. In Group A LVEDV decreased thirty three point four%. In Group B mean LVEDV increased but not significantly. In Group A% uptake of MIBI slightly increased in all segments, and in Group B slightly decreased in most segments.% uptake of FDG improved 11(eleven)% in septal segment and 10% in anterior segments in Group A. But in Group B% uptake of FDG decreased in all segments. In Group A% wall thickening in septum tended to improve in both gated MIBI SPECT and gated FDG PET. In Group B% wall thickening did not change a lot in all segments.

Conclusion: These results suggest that the improvement of glucose metabolism and wall thickening in septum may be related to reverse remodeling as benefit of CRT. Gated FDG PET can be used to evaluate improvement of regional wall thickening of the patients with heart failure treated by CRT.

INTERATRIAL CONDUCTION TIMES AS A DETERMINANT OF THE DURATION OF THE OPTIMAL AV DELAY IN BIVENTRICULAR PACING THERAPY OF CHF PATIENTS

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AV delay (AVD) is a critical hemodynamical parameter in biventricular pacing therapy of chronic heart failure. Independent of individual optimization method, its total length consists of two components characterizing individual electrical and electromechanical aspects.

Aims: To compare the causal electrical and electromechanical determinants of the optimal AV delay in biventricular pacing.

Methods: Using echo devices, both determinants of the optimal AV delay were separately measured by simultaneous recording of tele-metric right atrial sense-events, esophageal left atrial electrogram (LAE) and transmitral flow velocity (TMF). Programming unphysiologically long AVD during VDD operation, interatrial conduction time (IACT) is the interval between right atrial sense-event marker and left atrial deflection (LA) in the LAE. Length of undisturbed left atrial electromechanical contribution (LA-EAClong) can be measured between LA and end of atrial contribution (EAC) in TMF. Programming unpysiologically short AVD during DDD operation, IACT ist the interval between atrial stimulus and LA. The latency between premature ventricular stimulus (Sv) and the corresponding end of atrial contribution (EACshort) can be measures as Sv-EACshort in the TMF. In 11 CHF patients (6f, 5m; 68,9±9,2years) IACT in VDD and DDD operation, LA-EAClang and Sv-EACshort were measured to calculate optimal AVD in both modes by: IACT + LA-EAClong - Sv-EACshort.

Results: Results are demonstrated in the table as mean±SD:

	IACT	LA-EAClong	Sv-EACshort
VDD:	27,4±28,5ms	195,9±18,0ms	142,0±25,5ms
DDD:	109,9±27,3ms	difference: 53,8±25,8ms	

Conclusions: In biventricular pacing of CHF patients 1. IACT has an increased significance for the total AVD: 2. IACT is about one third of the total length of the AVD during VDD and 3. two thirds of it during DDD operation, at mean.

THE IMPORTANCE OF OPTIMAL LOWER RATE PROGRAMING OF ATRIO-BIVENTRICULAR PACING AT REST

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The optimal drug therapy and the implantation of three-chamber pacemaker to restore the electro-mechanical synchronisation of both ventricle is the major chance for the treatment of heart failure.

The aim of our study is to evaluate the hemodynamic changes on the background of the improvement of physical state caused by the resynchronisation

Patients, methods: 14 patients (2 female, 12 male, mean age 63±6,4 year) underwent the implantation of this type of pacemaker. All of the patients had a decreased left ventricular function (EF=25±4,2%) and sinus rhythm with left bundle branch block on the ECG. Hemodynamic changes at rest were recorded by Thoracic Electric Bio-impedance. The optimal lower rate in atrio-biventricular mode of pacing was determined in all patients, which was compared with the A-V sequential right ventricular pacing and the patients own heart rhythm, respectively. Paired t test was used for the statistical analysis.

Results: Optimal heart rate was 70 and 80 bpm five-five patients, 75 bmp was preferred only in one. The CI measured in biventricular pacing at this frequency was significantly higher compared with the CI recorded in patients own heart rhythm (p<0,0005). The rate dependency of SVI was highly significant at 60, 70, 80 bpm (p<0,003). The decrease in SVR at 60 bpm was not observed, but at the higher pacing rates significant depression in SVR could be detected (p<0,0009).

Summary: Setting of the optimal pacing rate was the essential factor of the adaptation due to the improvement of cardiac index and decreasing SVR optimizing the heart work. The frequency dependent changes in SVI played a nondominant role in the hemodynamic adaptation because of the depressed left ventricular function.

IMPORTANCE OF ELECTRODE PACING IMPEDANCE IN THE CHOICE OF PACEMAKER PROGRAMMING

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Measurement of electrode impedance is usually performed to confirm the integrity of the pacing system. The importance of pacing impedance, as a parameter influencing current drain and battery longevity, is generally disregarded. Pacing polarity configuration may affect both electrode impedance and pacing threshold. Aim of the study is intracatheter comparison between pacing impedance and pacing threshold in unipolar and in bipolar configuration. Methods: we measured electrode impedance and pacing threshold in unipolar and bipolar configuration in 365 electrodes of various characteristics and different manufacturers, which had been implanted since more than three months. Statistical significance was evaluated by two tailed paired Student's T-test. Results: impedance in unipolar configuration was 564 ± 153 ohm, in bipolar 662 ± 182 ohm ($p<0.0001$). Pacing threshold at 0.4 ms in unipolar was 0.70 ± 0.4 V, in bipolar 0.78 ± 0.51V ($p<0.002$). The analysis of subgroups of catheters confirms this trend, especially in high impedance electrodes. Conclusions: both impedance and pacing threshold are significantly higher in bipolar configuration. However the difference in pacing threshold has little practical impact, as it does not require programming of higher outputs. The difference in pacing impedance on the contrary may be used to decrease pacing consumption and increase battery longevity. As pacing consumption is inversely proportional to electrode impedance, at the same programmed output the bipolar pacing configuration should be chosen.

ACUTE ELECTRICAL DATA ON 2792 VENTRICULAR PACING LEADS
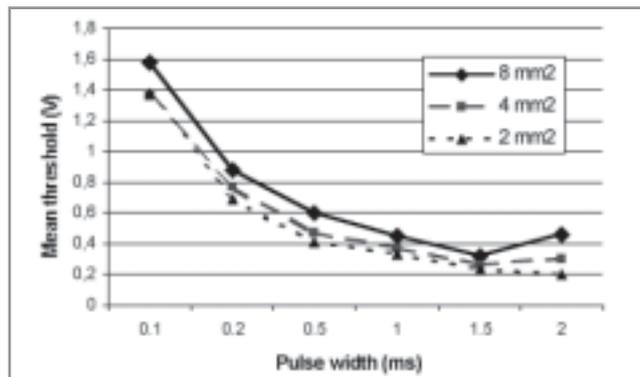
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Various studies have shown the interest of reducing distal electrode area to increase pacing impedance. We report our acute experience on various ventricular pacing leads from ELA Medical (France), using vitreous carbon tip-electrodes of 8, 4 or 2 mm². The following table summarizes the data:

Tip-electrode surface area	8 mm²	4 mm²	2 mm²	p
Models	PBC(F)0860, PMC(F)0860	BT46(D), T44F	BT(F)26D	-
Nb of patients	1997	612	183	-
Males (%)	54.5	57.5	50.3	
Age (years)	78 ± 11	78 ± 10	81± 9	P<0.05
R-wave (mV)	8.8 ± 3.6	9.6 ± 4.4	9.6 ± 4.2	NS
Slew rate (V/s)	1.8 ± 1.5	2.0 ± 1.4	2.2 ± 1.3	NS
Pacing impedance (Σ)	564 ± 199	676 ± 113	757 ± 133	P<0.01
Polarization (mV)	176 ± 105	227 ± 97	237 ± 88	P<0.0001
Pacing threshold (V, at 0,5 ms)	0.60 ± 0.85	0.47 ± 0.23	0.41 ± 0.17	P<0.0001

The following figure presents Lapicque-Weiss curves obtained with these leads:

Conclusions. Our experience confirms that decreasing tip-electrode surface area has a significant positive impact on acute pacing impedance and thresholds at all pulse width durations.

## A 10-YEAR EXPERIENCE ON 2792 VENTRICULAR PACING LEADS

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Various studies have shown the interest of reducing distal electrode area to increase pacing impedance. We report our experience on 10 years concerning electrical data of ventricular pacing leads from ELA Medical (France), using vitreous carbon tip-electrodes of 8, 4 or 2 mm². The following table summarizes the study population:

Tip-electrode surface area	8 mm²	4 mm²	2 mm²
Lead models	PBC(F)0860, PMC(F)0860	BT46(D), T44F	BT(F)26D
Nb of patients	1997	612	183
Males (%)	54.5	57.5	50.3
Age (years)	78 ± 11	78 ± 10	81± 9

The following figure presents the pacing threshold curves obtained with these leads during follow-up (FU) at 0.5 pulse width, month per month, and after polynomial regression (2nd order):
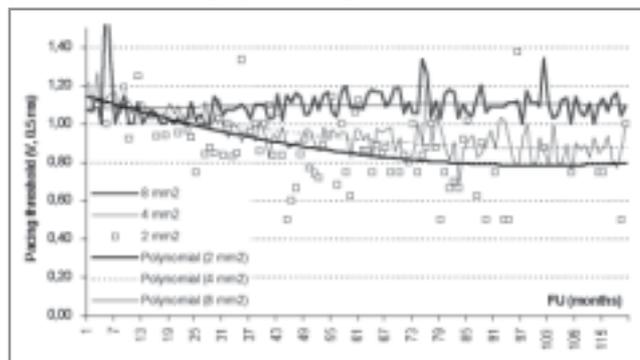
Electrode surface	8 mm²	4 mm²	2 mm²	P (t-test)
Pacing Impedance (Σ)	504 ± 75	620 ± 38	714 ± 73	<0.0001
Pacing threshold (V)	1.1 ± 0.09	0.95 ± 0.11	0.88 ± 0.22	<0.0001

Conclusions. Our experience confirms that decreasing tip-electrode surface area has a permanent and significant positive impact on chronic pacing impedance and thresholds.

IS DIPYRIDAMOLE THALLIUM-201 SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY APPROPRIATE IN THE DIAGNOSIS OF CORONARY ARTERY DISEASE IN PACED PATIENTS ?

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BACKGROUND. Specificity of exercise perfusion scintigraphy is decreased in patients (pts)with left bundle branch block and in pts with cardiac pacemaker (PM). PM is associated with a conduction abnormality that may result in false positive perfusion defects. Dipyridamole thallium 201 single-photon emission computed tomography (dip-SPECT) is the accepted non-invasive technique for detecting coronary artery disease (CAD) in PM pts. We test the accuracy of dip-SPECT in detecting CAD in pts with PM.
METHODS: 94 pts (55 M; 39 F; age: 70+12 yrs) with PM underwent dip-SPECT and coronary angiography (CA) within 2 months for chest pain.
RESULTS. 60 pts (64%) showed perfusion defects on SPECT, 45 (48%) showed at least 1 stenosis > 50% on CA. Pts were classified according to the concordance between SPECT and CA: Group A: 29 (31%) with normal SPECT/normal CA; Group B: 40 (43%) with abnormal SPECT/abnormal CA; Group C: 5 (5%) with normal SPECT/abnormal CA; Group D: 20 pts (21%) with abnormal SPECT/normal CA. Specificity of SPECT for identifying patients with CAD was 59%, sensitivity 89%, positive accuracy 67%, negative accuracy 85%. In Group D 14/20 (70%) was continuously paced during the test compared to 72% (n=21) of pts with normal results by both techniques (Group A) (ns). False positive reversible defects in group D were localized to infero-postero-lateral (n=11, 55%), septal (n=5 25%), antero-septal/antero-lateral (n=9 45%) and apical (n=4 20%) walls, with discordance between perfusion defects and culprit lesion in 9/40 (22%) Group B pts.
CONCLUSIONS: PM is associated with abnormalities of myocardial perfusion and is partially responsible for unsatisfactory specificity of dip-SPECT.

SLEEP PARAMETERS IN PATIENTS(PT) USING INTEGRITY PACEMAKERS (PM) WITH SLEEP RATE FUNCTION ON

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The Cardiovascular System(CS) has functional alteration during the sleep. CS relaxation occurs during the NREM (Non-Rapid Eyes Movement) sleep(stages 3 and 4). The REM(Rapid Eyes Movement) sleep, the most quantity of rapid ocular movements is concentrated. The sleep respiratory disorders are associated to a cardiac rhythm disorder such as brady-tachycardia, atrial fibrillation and ventricular arrhythmias. Treatment with (PM) showed an abnormal respiratory event reduction during the sleep. A new algorithm was incorporated in PM. which permits a reduction of the basic rate if. Target: comparison with Pt sleep parameters using PM with rate adjust based on absence of activity (Integrity DR) on and off sleep rate function. Methods: We evaluated 22 Pt (14 women) with indications were: SSS, Complete AV Block and AF, in a double blind study (polysomnography). Results: Sleep efficiency improvement (total sleeping time) was showed by 12 Pt (54%) with on. These Pt had had the worst sleep efficiency with off in comparison to those whose parameters have not been changed (72 + 12 X 81 + 7%, p=0,01 respectively). This first group had lower latency for REM sleep that the last one (89 + 55 X 174 + 107 min, p=0,01, respectively). The microawakening(mw) number per hour was reduced in ten Pt (45%) with the on. If compared to those who have not changed this parameter, the first one

was more sleepy (ESE: 9 + 4 X 5 + 5, p= 0,04, respectively), and showed more mw with off (20 + 14 X 7 + 5 mw / hour, p=0,007). Conclusions: The PM use with the rest rate adjust on increased the Pt sleep quality and time in Pt who presented injured sleep.

CHAGAS HEART DISEASE: PREDICTORS OF SUDDEN DEATH

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Background: The involvement of Chagas disease is characterizer mianly by chronic myocardits. The main histopathologic alterations include multifocal lymphomonoclear infiltrate and intersticial fibrosis which are responsible for myocardial devervation and severe ventricular arrhythmias. The aim of this studywas the identification of sudden death predictors in Subjects for Chagas disease.
Methods: Information regarding these subjects was accumulated prospectively in a data bank between 1971 and 1996. Subjects (n= 987, 62,5% men, median age 45 years), with no evidence of other heart diseases, were eveluted clinically and underwent a resting 12 lead ECG, chest X-Ray, and cambined right and left ventricular performance was accomplished by contrast ventriculography, and an LV Ejection Fraction (LVEF) of <= 63% was considered depressed. These subjects were followed for 7 5.7 years and up to 22 years.
Results: Amongh the subjects there were 368 deaths abed of these 142 were Sds. Most of the Sds occurred in the first 5 years (73%) and almost all (92%) during the first 10 years of followup. Fifteen of the variables studied by univariable analysis (multiple logistic regression) only 4 variables proved to be independent predictors of SD: Abnormal 12 leads ECG,Cardiomegaly on CXR (p=0,05), presence of any form of Ventricular Tachycardia on ECG and depressed LVEF.
Conclusion: SD occurred in 39% of all deaths among 987 subjects with Chagas disease and followed for up to 22 years. Of the 4 variables with prognostic value for SD, 3 were obtained with non-invasive/low cost testing. LV function was evaluated with contrast ventriculography, however, today, other non-invasive tests (echocardiography and nuclear medicine) can offer e similar information. The ventricular dysfunction, suggestd by cardiomegaly on CXR and identified by the depressed LVEF is important predictor of SD in chronic Chagas disease.

SHORTENING OF AV DELAY REDUCED DEGREE OF MITRAL REGURGITATION IN PATIENT WITH DDD PACEMAKER

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OBJECTIVE. In patients with an implanted DDD pacemaker in general there is a question regarding the ideal AV delay. In the case of too short an AV delay, the atrial contribution may be interrupted, while the filling time may be shortened by too long an AV delay.
The problem is even more complex if (isolated) severe mitral regurgitation coexists together with conduction disturbance indicating the cardiac pacing.
Some data exist that the shortening of AV delay reduces the degree of mitral regurgitation in patients with DDD pacemakers and some authors reported the efficacy of short atrioventricular (AV) delay in patients with severely reduced cardiac function.
METHODS. In 1998, at the age of 40, a patient was operated for ASD ostium primum (patch plastic) with correction of posterior mitral

leaflet (he also had prolaps of posterior mitral valve leaflet). Because of trifascicular block (LAH; RBBB, +PQ prolongation) a permanent cardiac pacemaker (DDD) was implanted.

RESULTS. The 40-year-old patient was operated for ASD ostium primum with correction of posterior mitral leaflet. Because of trifascicular block a permanent cardiac pacemaker (DDD) was implanted. After a few years, the patient was hospitalised because of paroxysmal atrial flutter, when severe mitral insufficiency was found. The patient still refused operative treatment, so we had to find a conservative solution.

Finnaly, we decided to shorten AV delay in order to reduce the degree of mitral insufficiency.

Following the shortening of AV delay, a significant reduction of mitral insufficiency and left atrial size were detected.

CONCLUSION. Shortening of A-V delay significantly reduced both mitral insufficiency and left atrial size in patient operated for ASD ostium primum tipe and correction of posterior mitral leaflet.

SINGLE LEAD VDD PACING: THE BEST CHOICE FOR PATIENTS WITH A-V BLOCK AND NORMAL SINUS FUNCTION?

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Single lead VDD pacing is recommended as first choice pacemaker for patients (pts) with A-V block and normal sinus function, in order to maintain A-V synchrony, by the ACC/AHA/HRS 2002 Guideline on Implantation of Cardiac Pacemakers and Antiarrhythmia Devices. Less time consuming is one of the major points in favour of this pacing modality, in spite of the fact that DDD mode is considered more reliable as regards A-V synchrony. From the early nineties to june 2004 more than 500 single lead VDD/VDDR pacemakers (PM) have been implanted in our department in pts with above mentioned electrocardiographic characteristics. We retrospectively studied the outcome of 202 single lead VDD/VDDR PM of several brands, implanted between January 2000 and December 2003; since no particular attention had been paid, during implants, in choosing patient adapted interelectrode distance leads, we looked for the need of mode reprogramming due to a loss of atrial sensing or to the occurrence of atrial fibrillation (AF); moreover, we looked for a correlation between these events and P wave amplitude and age of pts at the time of implant. 25 pts resulted lost at follow-up (FU) and no more considered for further analysis. Mean age of 177 pts was 73.2 years and the mean amplitude of P wave, sensed by floating atrial dipole, was 2.06 mV at implant. During a mean FU of 30.5 months, 13 pts(7.34%) needed to be reprogrammed to VVI/VVIR mode, owing to the occurrence of Af or to a not corrogible loss of atrial sensing: the mean time from implant to reprogrammation was 12.9 months; in two cases catheter repositioning was needed; P wave amplitude at implant of reprogrammed patients was 1.58 mV and mean age was 78.4 years. Although availability of multiple interelectrode distance could improve long-term results with regard to A-V synchrony, VDD single lead pacing demonstrated to be, in our experience, a reliable mode of stimulation in pts with impaired A-V conduction and good sinus node function.

PREVALENCE OF ATRIAL AND VENTRICULAR ARRHYTHMIAS IN A PACEMAKER PATIENTS POPULATION

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[1]HEGP, [2]HOSPITAL, [3]SAINT JUDE MEDICAL

The objective of this register is to evaluate the prevalence of atrial and ventricular arrhythmias in a population of patients implanted with a dual chamber pacemaker.

Method: 97 patients (mean age = 78±11 years, 59% male) were implanted with an Identity DR pacemaker, able to store atrial and ventricular intracardiac electrograms (IEGM) triggered by the detection of different events, all programmable.

Events triggers were set to High Atrial Rate (HAR): 5 beats >175min-1, High Ventricular Rate (HVR): 5 beats >175min-1, and 2 to 5 consecutive PVC.

Stored IEGM were activated at predischarge and retrieved at the first follow-up between 1 to 6 months (mean follow-up: 3.2±2.6 months). Pacing indications were 42% SND, 52% AVB, 6% other. 40% were already known for AT/AF or other atrial arrhythmia.

Results:

453 EGMS were retrieved and analyzed.		
High A rate		
42 Pts	NSAT, PAC salve, A Flutter, AT/AF	26 (62%)
	cross-talk	5 (12%)
	Noise, oversensing	11 (26%)
	Competitive rhythm with PM algorithm	2 (5%)
High V rate		
16 Pts	NSVT	4 (25%)
	SupraVentricular Tachycardia	2 (12.5%)
	Noise, oversensing, lead problem	10 (62.5%)
PVC		
54 Pts	PVC, NSVT	27 (50%)
	Atrial undersensing	34 (63%)
	Noise	4 (7%)

Conclusion: In most cases, IEGM is reliable enough to diagnose arrhythmias or to highlight inappropriate device settings. In this pacemaker patients population, IEGM confirmed that at least 27% (26/97pts) of them present atrial arrhythmias or salves, and allowed to diagnose unsuspected episodes of NSVT in 7 patients. Oversensing and noise mostly occurred in unipolar sensing configuration.

EFFECT OF OPTIMISED POSTVENTRICULAR ATRIAL BLANKING ON INAPPROPRIATE MODE SWITCHING

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Background: Farfield-R-wave sensing (FFS) is the most frequent cause for false positive mode switching (MS) and may result in inappropriate loss of AV-synchrony. Additionally, the reliability of MS counters used for arrhythmia diagnosis is impaired. The prospective randomised FFS-test study evaluates the incidence of FFS and the efficacy of an optimised programming of the postventricular atrial blanking (PVAB) based on a FFS-test.

Method: At discharge, patients (pts) were randomized to either individually optimised or nominal (100 ms) PVAB. Optimised PVAB was programmed 25 ms longer than the coupling interval of atrial FFS at 0.1 mV atrial sensitivity. Atrial sensitivity then was programmed to 0.3 mV in both groups. False positive MS was evaluated by stored electrograms at the 1 and 3 month follow-up.

Results: 199 pts (70 +/- 11 years, 64 females) have completed the 1 month follow-up. Indication for implantation was sinus nodal dis-

ease (n=88), binodal disease (n=27), AV-block (n=73) and others (n=11). 101 pts were assigned to optimised PVAB, 98 pts received nominal PVAB. False positive MS occurred in 5 (5%) pts of the FFS Test group. 2 of these pts had not received optimised PVAB due to atrial fibrillation or wrongly conducted test. In the nominal group false positive MS occurred in 22 (22%) pts (p<0.001). Optimised PVAB was <=100 ms in 45 pts, and >100 ms in 56 pts, with a median of 125 ms (range 85-165 ms). Amplitude of FFS potentials was between 0.2 mV and 1.0 mV (median 0.2 mV). False negative MS could not be observed.

Conclusion: Additional testing for atrial FFS and adjustment of the PVAB improves correct pacemaker function and the reliability of MS counters.

EVALUATION OF FUSION BEAT DETECTION WITH A NEW VENTRICULAR AUTOMATIC CAPTURE ALGORITHM IN ICDS

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Introduction: This study evaluated a newly developed automatic capture verification scheme for ICDs in respect to the discrimination of captured (C), fusion (F) and non-captured (NC) beats, with the emphasis on fusion detection. The algorithm uses evoked response detection based on a sensing vector from right ventricular shocking coil to Can. Methods: Patients undergoing ICD implant or replacement were enrolled into this study. An external device for pacing and data acquisition was used to promote ventricular fusion beats. VVI patients were paced close to their intrinsic underlying rhythm, DDD patients were paced close to their intrinsic AV interval. Various vectors of surface ECG and wideband filtered intracardiac electrograms were recorded for off-line analysis. Each event was classified visually and by the automatic detection algorithm. The algorithm performance was then evaluated by comparing the classification results. Results: 27 patients (22 male/5 female; 63,8 ± 12,5 years) were analyzed. Device and lead demographics were: 18 DDD/9 VVI; 16 dedicated BP/11 integrated BP leads; 18 acute/9 chronic (3,7 ± 2,0 years) leads. In total 2064 beats were analyzed, including 1477 F beats and 587 C beats. Sensitivity and specificity of the algorithm was 99,5% and 99,0%. Wrong classification occurred to 7 true F beats (0,5%) which were classified as C beats, 6 C beats (1,0%) were identified as F. No C or F beats were detected as NC beats. Conclusion: The algorithm is very effective in the detection of fusion beats. It can be potentially used in many ICD applications that need accurate fusion detection.

ATRIAL FIBRILLATION UNDER CONTROL OF DUAL CHAMBER PACEMAKER SYSTEM

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Heart rate variability (HRV) is defined as a short- or long-term variation of heart rate measured by beat to beat analysis. It represents a variable maker of autonomic activity. There are evidences for an association between HRV and propensity for lethal arrhythmias as sudden death and increased cardiovascular mortality.

Aim of study: Analysis of mechanism of atrial arrhythmias and HRV by pacemakers Prevent AF / Selection by Vitatron (n = 49) and Neway DR (n = 15) by Sorin Biomedica and long-time ECG.

Results: Different groups of pNN50 (pNN50 <25, pNN50 >25 and death (n = 3) we are found no varying echocardio-

graphic results (EF, LAD,LVDD, HMMI). But the cases of death arrange in the group of pNN50 >25.

Elderly patients characterized by small atrium, regular EF and reduced pNN50 profit by pacemaker based AV-synchronisation, other one do not it.

A regular atrium and higher pNN50 values point at a neurovegetative disturbance.

Case reports will be demonstrate it to discuss it.

Conclusion: The check up on atrial fibrillation and its onset mechanism and also the HRV is important. The pacemaker feature (Neway DR) of pNN50 analysis is important. It shows that the HRV short-time-analysis do not be efficiently. The long-time analysis makes quite sure the pharmacological therapy.

CARDIOVERSION AND DEFIBRILLATION FOR PACEMAKER USERS

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CARDIOVERSION FOR PACEMAKER USERS M van Damme,Pacemaker/ICD analyst,Maasland Hospital,Sittard Netherlands

Previous in-vivo readings for pre and post-cardioversion have revealed that the stimulation threshold can rise by an unfavorable paddle-position. By taking empirical readings and observations in an in-vitro setting, we tried to find out what takes place at the point of contact between the tip of the lead and the myocardial tissue. For the purposes of the study we came up with the following measurement set-up: on a 0.9% NaCl salt solution, voltmeter, monophasal and biphasal defibrillator. A pacemaker system were placed in a tray filled with 0.9% NaCl solution. Measurements were taken at energy levels rising from 50 to 300 Joules, and with different paddle positions. the voltage on the tip of the lead is measured where it comes into contact with the myocardial tissue at the different energy levels and paddle positions at the moment of the electric shock. Results The measurements revealed a spark-over it was visible by paralel lead and defibrillator dipole. The results reveal that there is a direct relationship between the amount of energy and padle position. the charge is highest by a paralel dipole and when they are perpendicular to each other, the charge is lowest. In the comparative study, whereby an electric shock mono and biphasal was given at the maximum energy setting for the biphasal defibrillator 200 joules, A 60% reduction in voltage was detectable with a biphasal pulse. The conclusion here is that biphasal defibrillation is more effective and perhaps causes less thermo tip-trauma. Conclusions the readings show that a paddle should be positioned as perpendicular as possible in relation to the pacemaker dipole

VENTRICULAR RATE STABILIZATION DURING ATRIAL FIBRILLATION IN SICK SINUS SYNDROME PATIENTS

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Ventricular response during Atrial Fibrillation (AF) can vary both intra and inter patient (Pt) according to different factors. For this reason, episodes could be symptomatic or asymptomatic, the haemodynamic disturbance being caused by the loss of atrial systole and by an inappropriately rapid and irregular ventricular rate.

AIM: to evaluate the VRS algorithm for Ventricular Rate Stabilization, by gathering prospectively heart rate values during conducted AF episodes. In DDD[R] mode, VRS is activated immediately after Mode Switching and provides a more stable heart rate by pacing and reducing long RR cycles.

METHODS: all Pts with SSS and documented AF have been implanted with a Vitatron SELECTION 9000 DDDR which can automatically store atrial and ventricular cycles before and after AF onsets.

All devices were programmed at a lower rate of 60 bpm; bipolar atrial sensitivity at 0.5 mV.

The first 20 cycles of all stored AF episodes were analyzed with VRS ON and VRS OFF.

RESULTS: 15 Pz (73±10, 10M) enrolled. 42 AF episodes stored in 5 months of follow-up. All episodes were asymptomatic, but 2 with VRS OFF. With VRS OFF, the range of cardiac cycles during AF was (520 - 896) ms, mean value 651±98 ms. With VRS ON, range was (535 - 722) ms; mean value 628±52 ms.

Ventricular pacing with VRS significantly reduced maximum RR intervals (881+232 vs 707+149 p<0.01), leaving unchanged both minimum RR interval (535+114 vs 520+154) and mean RR interval.

CONCLUSIONS: VRS seems effective to reduce cardiac cycle irregularities during conducted AF episodes without significatively altering the mean RR interval.

The vast majority of AF episodes were asymptomatic. Symptomatic episodes represent a relatively rare event.

A PACEMAKER EXPERT SYSTEM FOR ATRIAL FIBRILLATION: T-STAR INTERIM RESULTS

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Introduction: Digital pacemakers have the ability to store a large amount of diagnostic data. Furthermore modern pacemakers feature a wide array of algorithms for both rate and rhythm control in Atrial Fibrillation (AF). Analysis of all AF related diagnostics and activating the best algorithms in each individual patient might be time-consuming.

Therefore an expert system, the Therapy Advisor (TA), was developed. During initial interrogation the TA automatically analyses all data, indicates which diagnostics need attention by means of Main Observations (MOs), Detailed Information Messages (DIMs) and provides Programming Advices (PAs) to optimise pacemaker therapy.

T-STAR evaluates the AF related messages of the TA. These interim results include an analysis of the messages given by a computer simulation program of the TA in 38 patients.

Methods: Prospective, multicentre, observational study. Inclusion: Class I/II pacing indication, Registry Consent. Interim analysis: follow-up of 38 patients, appropriateness and clinical relevance of TA messages. The investigators were asked to diagnose and treat patients prior to using the TA.

Results: Including data of 38 patients: 26% male, age: 72.3 ± 8.3, primary indication: SSS 61%. Average time since implant: 24.5 ± 15.4 months. 6 patients were excluded due to protocol deviations.

71 messages concerning AF were generated in 16 out of 32 patients. 83% of all messages were considered to be appropriate to the investigators. In detail: 94% of MOs, 87% of DIMs and 63% of PAs.

In one case the TA gave a programming advice the investigator had not thought of.

The feedback of the investigators will be used to refine future upgrades.

Conclusion: These results confirm the clinical relevance of the Therapy Advisor for optimising the pacemaker AF therapy.

HYBRID ABLATION AND PREVENTIVE PACING THERAPY TO CONTROL PERSISTENT ATRIAL FIBRILLATION: HAPPI-AF PILOT STUDY RESULTS

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Introduction: Atrial fibrillation (AF) is the most common supra-ventricular tachyarrhythmia. In many patients (pts) with paroxysmal AF, foci located in the pulmonary veins initiate the arrhythmia and can be targeted for catheter ablation. However, evaluation of success has been largely limited to symptoms or infrequent 24-hour Holter recordings. Also, catheter ablation is generally of lower efficacy in pts with persistent or permanent AF. Preventive pacing algorithms (PPA) may be effective in reducing AF burden and recurrence of AF. The HAPPi-AF study aims to evaluate the effectiveness of the combination of PPA and ostial catheter ablation in pts with chronic AF. Pilot data is presented.

Methods: Prospective randomized-controlled study to 3 groups: Group A-PPA only (PPA), Group B-ablation only (Abl), Group C-PPA and ablation (PPA+Abl). Inclusion: Drug-resistant, symptomatic persistent or permanent AF. Device: Vitatron Selection 9000. Follow-up (FU): stratified into 3- and 6-month data. Outcome: Median AF burden and Mean AF burden and number of episodes.

Results: Data from 22 pts: 73% male, age: 57 ± 8 yrs, AF history: 63 ± 57.7 months.

Data per group (3 / 6 months FU):

Group A (PPA, n =7): Median (%): 0.9 / 1.2, Mean (%): 29.1 / 28.8, # episodes: 112.7 / 89.0

Group B (Abl, n =6): Median (%): 33.0 / 2.6, Mean (%): 32.6 / 5.9, # episodes: 1141.5 / 294.4

Group C (PPA+Abl, n =9): Median (%): 0.0 / 0.0, Mean (%): 3.0 / 1.1, # episodes: 34.0 / 185.3

Conclusions: This data suggests that the combination of PPA and ablation may be the preferred treatment for pts with persistent or permanent AF. The final data of the HAPPi-AF study including data from 150 pts will evaluate this.

LONG TERM PERFORMANCE OF A DYNAMIC ATRIAL OVERDRIVE ALGORITHM IN PAROXYSMAL ATRIAL FIBRILLATION

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Objective: Short-term study has suggested that utilizing a dynamic atrial overdrive (DAO) pacing algorithm can decrease symptomatic paroxysmal atrial fibrillation (PAF) burden. This is a long-term follow-up on the safety and efficacy of DAO pacing in patients with PAF.

Method and Results: Thirty patients (17 female, age 69 ± 8 years) with PAF and an indication for permanent pacing were implanted with dual chamber devices with DAO and followed for an average of 28 months (range 6 to 66 months). All patients had recurrent AF in the preceding 6 months before implantation and eighty-five percent had AF within 6 weeks. Prior to implant, patients were tried on an average of 3 anti-arrhythmics, amiodarone was used in 13 patients and 18 patients were on other Class I and III anti-arrhythmics. Four patients required electrical cardioversion. One peri-procedural pneumothorax was managed conservatively. Twenty-six patients remain on anti-arrhythmics at last follow-up, 12 on amiodarone. DAO pacing was discontinued in 3 patients (10%) because of angina (1 patient) or palpitations (2). Nine patients (30%) developed chronic atrial fibrillation. Eighteen patients (60%) remained in sinus rhythm with DAO pacing. These patients showed evidence of PAF as they were in mode switch an average of 9.5% of the time. Twenty-four patients were receiving warfarin at last follow-up. One patient in sinus rhythm who was not on warfarin had a TIA during follow-up. Two patients required AV nodal ablation.

Conclusions:

1) Long-term DAO pacing was well tolerated in the majority of the patients.

2) In this patient population with PAF requiring multiple anti-arrhythmics, 60% maintained sinus rhythm with long-term DAO pacing.
3) Despite maintenance of sinus rhythm, evidence of PAF persists with associated thromboembolic risks.

NOVEL THREE-CHAMBER PACEMAKER FOR BIATRIAL PACING - STRATOS LA - EXAMINATION AND EVALUATION OF RELIABILITY (STEER II) STUDY

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Biatrial pacing (BiA) has been used for prevention of AF in patients with interatrial conduction disorders for more than a decade. Technical difficulties, including inability to achieve reliable atrial resynchronization after sensed atrial beats, likely contributed to mixed clinical results with the improvised BiA pacing systems using Y adapters. A novel three-chamber biatrial PM (Stratos LA, BIOTRONIK) has a separate channel for each atrial lead, Far Field Protection Windows (FFPWs) for sensed (Vs) and paced (Vp) ventricular beats, overdrive and rate smoothing algorithms. The aim of the study was to evaluate safety and reliability of Stratos LA features. Methods: 20 patients (69.5 y, 55% male) with paroxysmal AF and a prolonged P-wave (mean 153ms) received Stratos LA pacemaker with coronary sinus leads for left atrial (LA) pacing and conventional right atrial (RA) and ventricular leads. Each patient underwent 6 follow-up (FU) examinations, from implantation to 6 months postoperatively. Results: In patients programmed to BiA triggered pacing mode (27 FUs; 10 pts), pacemaker counters indicated 951 +/- 1570 RA extrasystoles (RAES) and 1140 +/- 1874 LA extrasystoles (LAES) per day. Pts with less than 1 Mode-Switch (MS) episode per day showed a significantly lower number of RAES (20 +/- 23) and LAES (91 +/- 125) than pts with more frequent MS episodes (23 +/- 24 MS per day): 1954 +/- 1798 (RAES, p<0.01) and 2271 +/- 2220 (LAES, p<0.01). From 84 MS episodes documented in PM memory with the onset intracardiac electrogram, 77.4% were initiated by LAES and 22.6% by RAES. Conclusions: Stratos LA demonstrated safe and reliable clinical performance. AF episodes were mainly preceded by LAES. Resynchronization of the atria upon detection of LAES may be the way to decrease AF burden.

HEART RATE VARIABILITY BEFORE EPISODES OF SINOATRIAL WENCKEBACH BLOCK.

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The relation between the autonomic nervous system and prevalence of sinoatrial Wenckebach block (SWB) is unknown. In the group of 240 patients (aged 18-81 years) with syncope, presyncope or palpitations, the 24-hour ECG monitoring was performed. The spectral analysis of heart rate variability (HRV) was used to assess autonomic nervous system activity before the occurrence of sinoatrial Wenckebach block (SWB) episodes automatically recognised during ambulatory ECG monitoring in 51 of 240 subjects. Spectral power was measured at low frequencies (LF; 0.04 to 0.15 Hz) and high frequencies (HF; 0.15 to 0.4 Hz) on 5-minute segments covering the period of 30-25 minutes before and 5-minute period immediately before the onset of SWB.
In comparison with baseline period of 30 to 25 minutes, a significant increase in HF power (p = 0.0078) and in LF power (p = 0.0417) was noted during the 5-minute period before SWB. The LF/HF value during the baseline period was greater than that from the last 5-minute period before SWB (3.16 vs 2.06, p = 0.0003, respectively).

Conclusion. The changes in spectral component of HRV preceding the SWB reflect the augmentation of parasympathetic activity. Increased vagal tone can facilitate the initiation of SWB episodes.

ASSESSMENT OF INTERATRIAL CONDUCTION TIME IN TRANSESOPHAGEAL ATRIAL PACING AND USING DOPPLER ECHOCARDIOGRAPHIC MEASUREMENTS - PRELIMINARY REPORT

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INTRODUCTION: Multisite atrial pacing reduces or prevents atrial fibrillation in patients with prolonged interatrial conduction time (iaCT) which could be measured during invasive electrophysiology study (EP) and transesophageal atrial pacing (TAP). It is also possible to estimate interatrial conduction using Doppler transthoracic echocardiography (D-TTE). AIM OF THE STUDY: The aim of the study is to compare iaCT measured in TAP with iaCT assessed in D-TTE. PATIENTS AND METHODS: The study included 18 patients (12 female and 6 male) aged 24-72 years (45.5+/- 16.2). In each patient TAP and D-TTE were performed. During TAP the interval between the earliest start of the P waves on the standard ECG and the atrial deflection in esophageal recordings (PA) was assessed. In D-TTE: Doppler timing of iaCT (DT), measured as the difference in time intervals between tricuspid A wave onset and the R wave peak of QRS complex and the analogous points of mitral inflow (AQRS tri - AQRS mit). RESULTS: PA: 41,6 +/- 12.1 ms, DT: 13,6 +/- 14.1 ms, The correlation between PA and DT was 0.277 (tested by simple regression analysis). CONCLUSION: The correlation between iaCT measured as PA in TAP and DT in D-TTE was not found. However, further studies are needed, especially in a bigger patient population.

THE TRANSOESOPHAGEAL LEFT ATRIAL PACING AN ALTERNATIVE NON INVASIVE METHOD FOR THE ASSESSMENT OF SINUS NODE FUNCTION

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Aim: The purpose of the study was to evaluate the reliability of transoesophageal pacing (TOP) in the testing of sinus node (SN) function in patients with suspected sick sinus syndrome (SSS), comparing to the traditional electrophysiological study with endocardial pacing of the right atrium.
Methods: The study enrolled 63p who were under investigation of SN function. The results of SN tests obtained by endocardial right atrial pacing (EP) and by TOP were compared. The EP was performed in a conventional way, with pacing and non pacing equal intervals to assess different times of the SN function, and following by TOP and assessing again the same data, with the Arzbaecher method using the pill-electrode. We defined with both methods and compared the SN cycle length (SRCL), the SN recovery time (SNRT), the corrected SN recovery time (CSRT) and the sino-atrial conduction time (SACT).
Results: There were no statistical differences between the estimated times of SN function with the two methods, SACT in particular was not found to be more prolonged during TOP.

	SRCL (ms)	SNRT(ms)	CSRT(ms)	SACT(ms)
EP	1157±171	1371±184	369±172	185±86
TOP	1088±206	1065±197	368±157	175±71
p	>0.10	>0.10	>0.10	>0.10

Conclusion: The TOP of the left atrium is a not invasive method, simple applicable and useful, for the assessment of SN function with comparable and reliable results as the one obtained with the traditional EP of the right atrium.

PREDICTION OF FOCAL ATRIAL TACHYCARDIA ORIGIN SITE USING P WAVE CHARACTERISTICS

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Aim: Purpose of this study was to determine value of electrocardiographic P wave characteristics in prediction of focal atrial tachycardia origin site.

Methods: In a group of 5 patients focal right atrial (RA) tachycardia (AT) origin site was confirmed by successful radiofrequency catheter ablation: in 3 patients it was along crista terminalis (CT) and in 2 patients around superior limbus of coronary sinus ostium (CSOS). We analysed P wave polarity (P wave axis) during AT in standard leads, V1 and V6 and ratio of P wave duration during sinus rhythm (Ps) and during AT (Pt) expressed as index T=Ps/Pt.

Results: we correctly predicted AT origin site in all patients by electrocardiographic analysis of P wave. In 2 patients with CSOS(septal) origin site T>1 and in 3 patients with CT (lateral) origin site T=<1. In 2 patients with CSOS origin of AT and in 1 patient with AT from inferior CT (caudal origin sites), P wave was negative in inferior leads and V6 and in 2 patients with AT from superior CT (around sinus node) P wave was positive in inferior leads and V6 (cranial origin sites). Common finding in all patients was positive P wave in lead aVL and/or D1 as the indicator of right atrial AT origin.

Conclusion: P wave characteristics during AT and sinus rhythm may be usefull predictors of focal AT origin site: we could say is it right or left, septal or lateral, cranial or caudal.

DAY HOSPITAL MANAGEMENT OF PATIENTS WITH ATRIAL FIBRILLATION REDUCES INHOSPITAL PROCEDUR AND COSTS

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Purpose. Atrial fibrillation (AF) is the most common arrhythmia encountered in clinical practice, accounting for approximately one third of hospitalisations for cardiac rhythm disturbances. Some studies show that hospitalisation represents the major cost driver in the treatment of patients (pts) with AF. Starting from January 2003 we have managed pts with AF and Flutter in a day hospital program. The aim of the analysis was to evaluate the cost-effectiveness of this approach.

Material and Methods. We assessed hospital data regarding pts discharged from the cardiology department after presenting with not complicated cardiac arrhythmias (NCArr) during 2003 vs. 2002: we considered hospitalisation days and money- and time-consuming procedures, taking data from administrative database of the hospital (referring to DRG 139). Quality of data was randomly controlled comparing information in the forms with those in clinical folders, with a 10:1 ratio. We found correspondence of 97% in diagnosis and 100% in reported procedures.

Results. During 2003 number of pts discharged from cardiology department after presenting with NCArr was reduced as compared with 2002 (139 vs. 191). AF continued to be the more frequent arrhythmia diagnosed, in 99 (71.2%) vs. 140 (73.3%) pts.

In 2003 there was also a reduction in number of non-urgent hospital admissions, wich were 18 (12.9%) vs. 53 (27.7%), p=0.001; readmissions 10 (7.2%) vs. 26 (13.6%), p=0.06; hospitalisation days 304 vs. 474; transesophageal echocardiograms (TEEs) 17 (12.2%) vs. 43 (22.5%), p=0.01; DC cardioversions 44 (31.7%) vs. 86 (45%), p=0.014.

Conclusion. We observed a cut in hospitalisation costs for patients with NCArr, related to hospitalisation days and more expensive procedures (like TEEs), as a result of new day hospital program for AF and Flutter management.

HIGH NT-PRO-ANP PLASMA LEVELS IN HYPERTENSIVE PATIENTS PPRONE TO PAROXYSMAL ATRIAL FIBRILLATION

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Atrial natriuretic peptide (ANP) is a hormone synthesized in atrial myocytes as a prohormone and stored in secretory granules as a 126 amino-acid prohormone. ANP plasma levels have been related to increased atrial pressure, alterations of atrial refractoriness and therefore correlated with the initiation and duration of atrial fibrillation (AF). Increased atrial pressure resulting to stretch of the atrial myocyte fibres is the most important stimulus for the release of ANP into circulation. We assessed the prognostic value of NT-pro-ANP plasma levels to predict hypertensive patients (ps) predisposed to AF.

Methods: The study population consisted of 80 hypertensive ps, 50 (group A) with a history of paroxysmal AF (PAF) and 30 (group B) without. We measured the N-terminal part pro-ANP plasma levels. In 12 ps from group A the measurements were made during PAF.

Results: There were no differences between the two groups regarding clinical data (age: 58±12 vs 57.5±10 years, males 65% vs 60%, body mass index 27.57±3.2 vs 27.38±4.4kg/m2, systolic BP 147±12 vs 143±11 mmHg and diastolic BP 91±7 vs 90±9 mmHg, duration of hypertension 4.2±2.1 vs 3.9±2.3 years, p=NS for all data). Ps in group A had increased left ventricular mass index compared to group B (115±27 vs 85±19 gr/m2 p<0.001), while the left atrial dimensions and the left ventricular EF did not differ (3.72±3.64 vs 3.58±3.64 cm p=0.092 and 65% vs 67% p=NS). The NT-pro-ANP plasma levels were significantly higher in group A than group B (3623.87±3186 vs 1945.39±586.88 fmol/ml, p=0.0004). In addition NT-pro-ANP plasma levels were significantly higher during PAF (8155.99±3904.72 fmol/ml, p=0.002).Data statistical analysis revealed that NT-pro-ANP were high getting into pathological range in group A, but especially and significantly higher among hypertensive ps during PAF.

Conclusion: NT-pro-ANP plasma levels could be a significant and reliable predictive index for the detection of patient prone to the development of PAF in essential hypertensive ps while in sinus rhythm.

UTILITY AND SAFETY OF DC ELECTRICAL EXTERNAL CARDIOVERSION

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INTRODUCTION: many PTS with tachyarrhythmias gain medical attencion in the Emergency Room.Some of them are critically sick and prompt treatment is needed.Medical records with current antiarrhythmic treatment are often missing.PURPOSE:it was to evaluate the utility and safety of DC electrical external cardioversion with biphasic shock in the treatment of synchronized tachyarrhythmias in the Emergency Room.

MATERIALS, METHODS AND RESULTS: we report about 3 pts.In all the cases the electrical cardioversion was preceded by an echocardiographic examination and by sedation performed by the Anestesi-

ologist. PT1:RE17y.f.: PSVT(cycle300msec)echo:normal heart. 100J-1 shock-SR. PT2:CH 69 y.m.:atrial tachycardia (cycle 315 msec) echo:severe mitral insufficiency, EF%50%.200J-1 shock-SR. PT3:SA 70y.m.:VT (cycle 350 msec) ischaemic cardiopathy, EF35%. 50 J-1shock-SR. **CONCLUSIONS**: we conclude that DC Electrical external cardioversion with biphasic shocks is useful,effective and safe in the treatment of synchronized tachyarrhythmias in the Emergency Room

REDUCTION OF LVOT GRADIENT AND MR FOLLOWING IMPLANTATION OD DDD PACEMAKER IN PATIENT WITH IHSS

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OBJECTIVE. Hypertrohic obstructive cardiomyopathy is a genetically inherited disease with asymetric septal hypertrophy as a most common presentation.

The presence of bradyarrhythmias is a potential cause of syncope and sudden death in these patients. Studies have shown that implantation of dual-chamber pacemaker decreases symptoms, improves hemodynamics in left ventricle outflow obstruction in patients refractory to pharmacological therapy.

Some reported impact of the change of AV-delay on left ventricular outflow tract gradient.

METHODS . 82-year-old female patient presented with an anamnesis of shortness of breath and dizzines following physical exertion.

On admittance electrocardiography was detected sinus bradycardia 46/min, PQ-prolongation (0.26) and complete LBBB.

A harsh murmur was detected by cardiac auscultation.

Echo found hypertrophy in the basal part of the ventricular septum with obstruction of left ventricular outflow tract and peak gradient of 51mmHg, mitral regurgitation of 2+ angio level and SAM.

After discontinuation of the beta-blocker patient still had complaints so 24-hours ECG monitoring was performed. Apart from complete LBBB periods of second-degree AV block type II and complex ventricular polymorphic activity were detected.

An dual-chamber (DDD) pacemaker was implanted.

During the pacemaker check-up, the AV-delay was decreased from 150 to 100ms. Echocardiography detected a reduction of mitral regurgitation to 1+ angio level, and left ventricular outflow gradient of 20mmHg.

RESULTS. Following implantation of a dual-chamber pacemaker reduction of mitral regurgitation and left ventricle outflow tract gradient was found.

The patient no longer complained of dizziness and she was normally functioning in her every day activities.

CONCLUSIONS. The patients complaints (shortness of breath during mild exertion and dizziness) were probably caused by a combination of left ventricle outflow tract obstruction (increased on exertion) and intermittent second-degree AV block type II.

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The Cardiovascular System(CS) has functional alteration during the sleep. CS relaxation occurs during the NREM (Non-Rapid Eyes Movement) sleep(stages 3 and 4). The REM(Rapid Eyes Movement) sleep, the most quantity of rapid ocular movements is concentrated. The sleep respiratory disorders are associated to a cardiac rhythm disorder such as brady-tachycardia, atrial fibrillation and ventricular arrhythmias. Treatment with (PM) showed an abnormal respiratory event reduction during the sleep. A new algorithm was incorporated in PM. which permits a reduction of the basic rate if.

Target: comparison with Pt sleep parameters using PM with rate adjust based on absence of activity (Integrity DR) on and off sleep rate function. Methods: We evaluated 22 Pt (14 women) with indications were: SSS, Complete AV Block and AF, in a double blind study(polysomnography).

Results: Sleep efficiency improvement (total sleeping time) was showed by 12 Pt (54%) with on. These Pt had had the worst sleep efficiency with off in comparison to those whose parameters have not been changed (72 + 12 X 81 + 7%, p=0,01 respectively). This first group had lower latency for REM sleep that the last one (89 + 55 X 174 + 107 min, p=0,01, respectively). The microawakening(mw) number per hour was reduced in ten Pt (45%) with the on. If compared to those who have not changed this parameter, the first one was more sleepy (ESE: 9 + 4 X 5 + 5, p= 0,04, respectively), and showed more mw with off (20 + 14 X 7 + 5 mw / hour, p=0,007).

Conclusions: The PM use with the rest rate adjust on increased the Pt sleep quality and time in Pt who presented injured sleep.