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[01]
THE EFFICACY OF INTRAOPERATIVE ATRIAL RADIOFREQUENCY ABLATION FOR AF DURING CONCOMITANT CARDIAC SURGERY – THE SURGICAL ATRIAL FIBRILLATION SUPPRESSION (SAFS) STUDY

R. VEASEY[1], O. SEGAL[1], J. LARGE[1], J. SILBERBAUER[1], P. HONG[1], N. REDDY[2], M. LEWIS[2], U. TRIVEDI[2], A. COHEN[2], J. HYDE[2], N. SULKE[1]

[1]EAST SUSSEX HOSPITALS NHS TRUST, EASTBOURNE, UNITED KINGDOM; [2]ROYAL SUSSEX COUNTY HOSPITAL, BRIGHTON, UNITED KINGDOM

Purpose Studies assessing radiofrequency ablation (RFA) performed at the time of concomitant cardiac surgery for the treatment of atrial fibrillation (AF) have reported high success rates. The efficacy of intraoperative RFA for AF has been primarily determined by a single electrocardiogram (ECG) or 24 hour Holter monitoring performed at pre-determined follow-up intervals. This does not discriminate between those patients in whom AF has been cured and those who continue to suffer with paroxysms of AF. We sought to assess the efficacy of surgical RFA by means of prolonged post-operative ambulatory monitoring.
Methods 28 consecutive patients (age 74±6.3, 19 males) who had atrial RFA for AF at the time of concomitant elective cardiac surgery were assessed. Patients were reviewed at 6 weeks post-operatively and were monitored with beat to beat Holters for 7 days at 6 months post-surgery. Holters were inspected manually and AF recurrence was defined as greater than 30 beats of AF. Patients accurately documented time and duration of any symptoms and this was correlated with device Holter AF episodes.
Results At 6 months post operatively and prior to 7 day Holter monitoring, 21 patients (75%) had not demonstrated any evidence of AF recurrence. On Holter analysis the mean AF burden for all patients was 32.9±47.1%, with a mean number of AF episodes per patient of 1.14±2.59. No evidence of AF recurrence was observed in 61% of patients (n=17) with 7 day monitoring. Four patients had episodes of asymptomatic paroxysmal atrial fibrillation, with a mean AF burden of 12.6% for these individuals.
Conclusions Surgical RFA for the treatment of AF, performed at the time of concomitant cardiac surgery, is a highly successful procedure. However, prolonged cardiac monitoring demonstrates a significant number of patients to have asymptomatic episodes of atrial fibrillation. This has important implications for decisions regarding post-operative anti-arrhythmic and anticoagulant usage.

[02]
EVALUATING PATIENTS WITH ACUTE ISCHEMIC STROKE WITH SPECIAL REFERENCE TO NEWLY DEVELOPED ATRIAL FIBRILLATION IN CEREBRAL EMBOLISM

M. TAGAWA[1], S. TAKEUCHI[2], M. CHINUSHI[3], M. SAEKI[1], Y. TANIGUCHI[2], Y. NAKAMURA[1], Y. AIZAWA[3]

[1]DEPARTMENT OF CARDIOLOGY, NAGAOKA CHUO GENERAL HOSPITAL, NAGAOKA, JAPAN; [2]DEPARTMENT OF NEUROSURGERY, NAGAOKA CHUO GENERAL HOSPITAL, NAGAOKA, JAPAN; [3]FIRST DEPARTMENT OF INTERNAL MEDICINE, NIIGATA GRADUATE UNIVERSITY OF MEDICINE, NIIGATA, JAPAN

Purpose Cardioembolic strokes are extensive and have a poor prognosis. To identify the cardiovascular risk factors of cardioembolic stroke, we evaluated the cardiovascular status with special reference to persistent atrial fibrillation (AF) and paroxysmal atrial fibrillation (PAF) combined with the type of acute ischemic stroke.
Methods We divided 315 consecutive patients admitted to our Department of Neurosurgery with an acute ischemic stroke into four types of brain infarction using clinical history, onset pattern of stroke, and brain imaging: cardioembolic (group E, n=105), lacunar (group L, n=92), atherothrombotic (group T, n=111), and unclassified (n=7). All patients underwent standard electrocardiography (ECG), a 24-hr ECG recording (Holter ECG) and transthoracic echocardiography (UCG).
Results Persistent AF or PAF was detected in 97 patients (31.5%) using Holter ECG: more frequently in group E (67.6%) than in groups L (15.2%) or T (9.2%). Persistent AF or PAF was first diagnosed on admission using a standard ECG in 16 patients (5.2%) with no previous history and 14 of these patients belonged to group E (13.3%). PAF was newly detected on Holter ECG in another 26 patients (8.4%) and 13 of these patients (12.4%) belonged to group E. Concerning UCG, left atrial enlargement and mitral regurgitation were more frequent in group E than in group L or T.
Conclusion Holter ECG in addition to ECG on admission is important for detecting persistent AF or PAF in patients with ischemic stroke, especially with cardioembolism as diagnosed by neuroimaging.

[03]
LEFT ATRIAL PLATELET AGGREGABILITY IN NON-VALVULAR ATRIAL FIBRILLATION

P. SULC, J. CHARVAT, J. KAUTZNER, R. CIHAK, D. WICHTERLE, V. MELENOVSKY

IKEM, PRAHA, CZECH REPUBLIC

Purpose In patients with atrial fibrillation (AF), intracardiac thrombosis is observed more frequently in the left atrium (LA) than in the right atrium (RA). Besides the differences in anatomy, we hypothesized that transit through low-shear pulmonary circulation may increase platelet aggregability and thus contribute to increased risk of LA thrombosis, particularly in subjects with chronic AF (cAF).
Materials and methods We examined aspirin-free subjects (age 55±10 y) with paroxysmal (pAF, n=7) or chronic (cAF, n=6) non-valvular AF undergoing catheter pulmonary vein isolation, matched for age, sex, LA diameter and prevalence of diabetes/hypertension. Plasma samples (3,8% citrate) were obtained from femoral artery (AR), RA and LA immediately after transseptal puncture. Turbidimetric aggregometry (Biodata Corp.) was used to quantify platelet aggregation (%) with varying concentrations of ADP (1, 5, 10 uM/l), epinephrine (1, 10, 100 uM/l) or ristocetine.
Results No significant RA-LA or pAF-cAF differences were found in spontaneous or epinehrine, ristocetine or high-dose (5, 10 uM/l) ADP-stimulated aggregation, platelet count or mean platelet volume. Low-dose (1 uM/l) ADP-stimulated platelet aggregation was actually lower in LA than in RA (29±30% vs 36±37, p=0,02). However, cAF subjects displayed markedly increased 1mM ADP-stimulated aggregability in LA, RA and peripheral artery, compared to pAF.
Conclusions Platelet aggregability in LA is not increased compared to RA, suggesting primary role of anatomy and coagulation abnormalities for establishment of LA thrombus.
However, chronic AF is associated with both atrial and systemic arterial platelet activation with selective increase of aggregability after low-dose ADP, not explainable by co-morbid conditions.

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[04]
THE SURGICAL ABLATION OF SUBSTRATE OF ATRIAL FIBRILLATION IN THE SURGICAL TREATMENT OF ARRHYTHMIA

W. SARNOWSKI, B. PEREK, W. STACHOWIAK, P. BUCZKOWSKI, T. URBANOWICZ, M. MISTERSKI, M. PUSLECKI, L. PALUSZKIEWICZ, S. KATARZYNSKI, J. TOMCZYK, E. CAMACHO, M. LIGOWSKI, M. JEMIELITY

DEPARTMENT OF CARDIAC SURGERY, POZNAN, POLAND

Background Some patients after valve replacement do not improve postoperatively as far as functional status is concerned, because of coexisted atrial fibrillation (AF). The aim of this study was to evaluate the efficacy of irrigated radiofrequency endocardial ablation (IRF) in patients with organic valve diseases treated surgically.
Material and methods Our study involved 79 pts. (24 M, 55 F) with the mean age of 60,7+-7,9 years. The primary indication for the surgery was: mitral valve disease – 42 patients, aortic valve disease 4 pts, combined mitral and aortic valve disease – 9 pts., combined mitral and tricuspid valve disease-11 three valves – 2 pts. We divided the patients into two groups according to the type of atrial fibrillation. G I (n=33) – permanent AF -and G II- paroxysmal AF (n=35), due to monopolar IRF ablation.
All the patients were operated with the use of cardiopulmonary bypass. After left atrial opening left atrium, endocardial radiofrequency ablation was performed according do modified Maze III technique.
Results The was one early postoperative death (5th day) due to heart failure. After the operation the rate of sinus rhythm (SR) in GI there was 66% and in G II s 74% SR. After the follow up of 7 days the rate of sinus rhythm was in was 57% and 82% respectively in G I and G II. The follow up of one month showed the rate of sinus rhythm of 57% in G I and 82% in G II and six months after the surgery the rate of SR decreased to the value of 43% in G I and to 76% in G II.
Conclusion The surgical endocardial radiofrequency ablation treatment is proper method of treatment for the patients with valvular heart disease coexisted with the AF.

[05]
ANTIARRYTHMIC TREATMENT PREVENTING ATRIAL FIBRILLATION RECURRENCES EARLY AFTER ELECTRICAL CARDIOVERSION

V. ROMANO, L. PAPAVASILEIIOU, L. SANTINI, A. PANELLA, G. FORLEO, L. DE LUCA, M. SGUEGLIA, G. MAGLIANO, M. BORZI, F. ROMEO

DEPARTMENT OF CARDIOLOGY, UNIVERSITY OF TOR VERGATA, ROME, ITALY

Purpose Efficacy of electrical cardioversion in restoring sinus rhythm in persistent atrial fibrillation (AF) is limited by a high relapse rate. It is reported that in more of one-third of cases, AF recurs within 2 weeks after ECV. Thereafter the probability of recurrence decreases and becomes more constant over time.
Methods We performed electrical cardioversion (ECV) in 65 consecutive patients. 14 pts were lost at follow-up, the remaining 51 pts (mean age 69±4 years, mean weight 79±4 kg, left atrium diameter 45±4 mm, LVEF 57±5%) were affected by persistent atrial fibrillation (mean duration 12,7±50 months) and hypertension. All patients received effective anticoagulant therapy. The antiarrhythmic treatment was: 8 pts flecainide, 10 propafenone, 12 amiodarone, 15 amiodarone + flecainide, 3 sotalol and 3 without antiarrhythmic therapy. We evaluated AF recurrence at one week after ECV, 1 month, 3 and 6 months.
Results One week after successful ECV 16/51 pts (31%) presented AF recurrence. (8 pts on amiodarone treatment, 2 pts on amiodarone+ flecainide, 1 pt on sotalol, 1 pt on flecainide, 4 pts on propafenone). In 6 patients we preferred rate control strategy. In the 8 pts in treatment with amiodarone, 150 mg/die of flecainide were added restoring sinus rhythm within a week. In 2 pts on IC drugs SR was restored within a week increasing the dose of antiarrhythmic. At 3 months, AF recurred in 2 more pts (2/43, 4,6%). At six months (37 pts) none showed new episode of AF.
Conclusions In our study we can confirm that the relapse rate of AF within a week after ECV is high as 31% of the cases. A more aggressive antiarrhythmic treatment in the first weeks after ECV can help maintaining SR or in case of AF recurrence, can restore SR.

[06]
PERMANENT ATRIAL FIBRILLATION: CAN PEAK A WAVE VELOCITY PREDICT THE RECURRENCE AFTER ELECTRICAL CARDIOVERSION?

R. PEREZ DE LA YGLESIA, E. ARANA RUEDA, A. PEDROTE MARTINEZ, N. ROMERO RODRIGUEZ, J. FERNANDEZ PEREZ, F. ERRAZQUIN, M. MOGOLLON JIMENEZ, M. FRUTOS LOPEZ

ARRHYTHMIA UNIT, VIRGEN DEL ROCÍO UNIVERSITY HOSPITAL, SEVILLE, SPAIN

Introduction Auricular stunning (AS), the transient impairment of atrial function, is a frequent event after electrical cardioversion (ECV) of atrial fibrillation (AF) and although its quantification is not well standardized and its physiopathology is not well known, it might be determinant in the thrombo-embolic risk and the arrhythmic relapse.
Purpose To know whether the measure of the AS after the ECV of AF using a quantitative method (peak A wave velocity using pulsed doppler) is a good relapse predictor.
Methods Prospective observational study which included 21 patients with persistent non-valvular AF that underwent ECV. All patients had a transthoracic echocardiography 3 hours, 48 hours, 7 and 30 days after the ECV, defining auricular stunning with peak A wave velocity (<0,5 m/s mitral/<0,3 m/s tricuspid). Clinical evolution was also valued after the first and sixth month of follow-up.
Results An incidence of 85% of left AS and 66% of right AS was observed just after ECV of AF. There were 9 cases of AF relapse in the first month (Group A) that raised up to 15 after the sixth month. There were no significant differences in age, sex, cardiopathy associated, AF duration, ECV energy administered, body mass index and left atrium volume between both groups (Group A and not relapsed-Group B). A significant increase in the 48-hour medium mitral peak A wave velocity was observed in group B compared to group A (0,34 m/s to 0,46 m/s vs 0,38 m/s to 0,38 m/s; p<0.03). These differences were also observed in the tricuspid peak A wave.
Conclusion The first 48 hour evolution of the mitral peak A wave velocity after the ECV is an easy and reliable method to predict precocious AF relapse.

[07]
PLASMA TANSFORMING GROWTH FACTOR BETA 1 (TGF-β1) AS A BIOCHEMICAL MARKER TO PREDICT THE RECURRENCE OF ATRIAL FIBRILLATION AFTER SURGICAL MAZE PROCEDURE

Y. ON, D. SHIN, J. CHOI, K. SUNG, P. PARK, J. SUNG, E. JEON, J. KIM

SAMSUNG MEDICAL CENTER, SEOUL, SOUTH KOREA

Background Atrial remodeling leads to perpetuation of atrial fibrillation (AF). Structural remodeling in the form of fibrosis alters the substrate. The surgical Maze procedure was developed as a surgical treatment of AF. Our purpose was to evaluate the role of plasma TGF-β1 in predicting the recurrence of AF after surgical Maze procedure. And we also evaluated the association of expression of TGF-β1 ANP, collagen-I, and collagen-III in LA with the recurrence of AF after surgical Maze procedure.

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Methods Preoperative plasma NT-proBNP, hsCRP, TIMP, TGF-β1, MMP-3, and pro-MMP-1 levels were measured in consecutive 86 patients (age 54±12 yrs) who underwent the open heart operation for valvular heart disease and surgical Maze for AF. Moreover, we performed molecular examinations of CTGF, TGF-β1, BNP, ANP, Collagen-Ia, Collagen-IIIa in the resected left atrial tissues. Symptomatic AF documented by ECG or an episode of AF revealed at follow-up holter monitoring were considered atrial fibrillation recurrences.
Results At 1-year follow-up, 10 among 86 patients had persistence of AF. Patients with AF persistence had higher plasma TGF-β1 levels than the patients with sinus rhythm (0.44±0.29 vs 0.32±0.15 ng/ml). Patients with AF persistence had higher messenger RNA expressions of Collagen-III· (0.21±0.20 vs 0.12±0.12, compared with internal standard GAPDH by RT-PCR) and lower messenger RNA expressions of ANP (0.31±0.16 vs 0.60±0.76, compared with internal standard GAPDH by RT-PCR) in left atrial tissues. Multiple logistic regression analysis revealed that plasma TGF-β1 was independently associated with postoperative persistence of atrial fibrillation at 1-year follow-up after surgical Maze procedure.
Conclusions Advanced atrial degenerative change might result in a decrease of atrial ANP secretion. Cardiac fibrosis might be a determinant of myocardial heterogeneity and the persistence of AF. Plasma TGF-β1 could predict the persistence of AF at 1-year follow-up after surgical Maze procedure.

[08]
DRUG-INDUCED QT PROLONGATION IN GUINEA PIG IS AUTOMATICALLY ANALYZED BY MAGNETOCARDIOGRAPHY SYSTEM WITH SUPERCONDUCTING QUANTUM INTERFERENCE DEVICE: COMPARISON WITH ECG

K. KOMAMURA[1], Y. ADACHI[2], J. KAWAI[2], M. MIYAMOTO[2], G. UEHARA[2], M. INAGAKI[1], M. SUGIMACHI[1]

[1]NATIONAL CARDIOVASCULAR CENTER, SUITA, JAPAN; [2]KANAZAWA INSTITUTE OF TECHNOLOGY, KANAZAWA, JAPAN

Purpose Drug-induced QT prolongation is a critical problem for drug development process. The guideline of International Conference on Harmonization requires to evaluate pre-clinical potential hazards of drug-induced QT prolongation. We have developed a micro- magnetocardiography (MCG) system for screening of QT prolongation in small animals utilizing ultrafine magnetometer array consisting of a 3x3 matrix of superconducting quantum interference device (SQUID) on a single silicon chip of 10 mm square. We compared QT interval in MCG with that in ECG.
Materials and Methods Ten male Hartley guinea pigs (250 g) were anesthetized with pentobarbital. Platinum needle electrodes were attached to animals. Excessive quinidine (60 mg/kg) was administered intraperitoneally. MCG and ECG were recorded simultaneously at baseline, 3, 5, 7, 10, 15 min after injection. QT interval was automatically analyzed (PowerLab, ADInstruments Pty Ltd) and QTc was calculated by Bazett formula.
Results QTc was prolonged from 284±10 to 299±11 msec significantly ($p<0.01$) in ECG (QTc-ECG). QTc was prolonged from 280±16 msec to 295±10 msec significantly ($p<0.01$) in MCG (QTc-MCG). QTc-MCG correlated well with QTc-ECG at baseline ($r^2=0.944$, $p<0.0001$) and also at 15min after injection ($r^2=0.780$, $p=0.0007$).
Conclusions Micro-MCG successfully measured drug-induced QT prolongation with good correlation with ECG in guinea pig. Non-contact characteristics of MCG may enable high throughput screening test for drug-induced QT prolongation.

[09]
INTERVENTRICULAR AND TRANSMURAL HETEROGENEITY OF ACTION POTENTIAL IN THE RAT HEART

N. KIM[1], P. COOPER[2], M. CANNELL[2], P. HUNTER[1]

[1]BIOENGINEERING INSTITUTE, THE UNIVERSITY OF AUCKLAND AUCKLAND NEW ZEALAND, [2]DEPARTMENT OF PHYSIOLOGY, THE UNIVERSITY OF AUCKLAND AUCKLAND NEW ZEALAND

Objective To compare the properties of action potentials of single myocytes isolated from different layers of the left ventricle, right ventricle, and interventricular septum and to test the hypothesis that differences in calcium transient contribute to regional differences in action potential duration.
Methods Myocytes were isolated from sub-endocardial, mid-myocardial and sub-epicardial layers of the rat ventricles and the right and left regions of septum. Membrane voltage and current were measured using the patch-clamp technique.
Results and Discussion Mean action potential duration measured at 20%, 50%, and 90% repolarisation (APD20, APD50, and APD90) was longer in sub-endocardial myocytes and septum than in mid-myocardial and sub-epicardial myocytes of left ventricle and right ventricle. The APD–voltage relationships (from -95 mV to -65 mV) were steeper in sub-endocardial of left ventricle and septum than in the others ($P<0.001$, ANOVA). The APD–rate relationship (stimulation frequencies 5, 3, 1 and 0.1 Hz) was steeper in sub-endocardial of left ventricle than in the others ($P<0.001$, ANOVA). These dynamics between APD and voltage were influenced by Ca2+ transient via stretch-related channels. Different modulation of Ca2+ influx through the other channels rather than L-type Ca2+ channels may well explain the interventricular as well as transmural heterogeneity of action potentials in the rat heart.

[10]
FREQUENCY OF ANTIBODIES ANTI-MUSCARINIC RECEPTOR IN PATIENTS WITH PERMANENT CARDIAC PACEMAKER IMPLANTATION

G. MORA, M. ECHEVERRY

UNIVERSIDAD NACIONAL DE COLOMBIA, BOGOTA, COLOMBIA

Antibodies that recognize and activate the cardiac, subtype II, muscarinic Acetyl Choline receptor I (m2MAChR) had been described in patients with cardiopathies from different origin. The meaning of the presence of these antibodies and their physiological relevance is still unclear.
To determine if the presence of these antibodies is associated to cardiopathies producing blockade of atrioventricular conduction and severe bradiarrhythmias, a cross sectional study was carried out in 116 patients originating from a general hospital in Bogotá-Colombia.
Methods Epidemiological and clinical data was obtained through interviews and serological tests were performed to determine the presence of antibodies anti-m2MAChR and anti-Trypanosoma cruzi. To asses the function of pacemaker telemetric monitoring was carried out for each patient.
Results We found that 37.1% of patients with permanent pacemaker have anti-m2MAChR antibodies, average of age was 59.6 years old, 34.5% of the patients were men and 65.5% women. The clinical indicators for the pacemaker implantation were: atrioventricular (AV) block in 69%, sick sinus syndrome in 26.7%, and atrial fibrillation blocked in 4.3%. The etiological diagnosis were: 50% Chagas´diseases, 27% degenerative disease, 14% congenital AV block, 3% ischemic heart disease and 6% other diagnosis.
We did not find any correlation between the presence of anti-m2MAChR antibodies and the clinical profile of the patients, or the

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pacemaker`s behavior. In the group of patients with Chagas´ disease the anti-m2MAChR antibodies frequency was higher than in the group with others etiological diagnosis (46.7 vs. 26.8 p<0.05).
Conclusion The frequency of anti-m2MAChR antibodies in patients with permanent pacemaker in Colombia is 37.1%. When Chagas' disease is taken as an etiological indicator for pacemaker implantation frequency increases to 46.7%. The current study did not find any association between the presence of anti-m2MAChR antibodies and the clinical profile of the patient with permanent pacemaker.

[11]
GROSS ANATOMIC FEATURES OF CORONARY SINUS OSTIUM IN CHINESE ADULT: IMPLICATION FOR DELIVERY OF CORONARY SINUS ELECTRODE

Z. CHENG, Q. FANG

PEKING UNION MEDICAL COLLEGE HOSPITAL, BEIJING, CHINA

Objectives To study the gross anatomic features of the coronary sinus ostium (CSos) and to evaluate the impact of the morphology and contours of CSos and the Thebesian valve to the implantation of electrode.
Method Eighteen heart specimens were included in the study. The morphology of the Thebesian valve was studied and the diameters in the orifices of the coronary sinus were measured by sliding calipers.
Results A total of 19 orifices of the coronary sinus were found in the 18 heart specimens, including one heart specimen with 2 orifices. No Thebesian was found in 5 specimens. There are four types of Thebesian valve: (1) crescent in 10, (2) fine strand in 2, (3) broad band in 1, (4) fenestrated in 1, which covering almost the whole orifice. The diameter of the orifice was 6.76∞}1.75∞i4.0~10.2∞jmm.
Discussion Coronary sinus has become a very important route for mapping during electrophysiology testing. In recent years CS also becomes a place for implantation of left ventricular pacing lead in biventricular pacing. However the implantation of the lead is sometime difficult. It seems that 5 patients without Thebesian valve allow the coronary sinus to communicate directly with the right atrium, and the delivery of the coronary sinus electrode easy. However a majority of orifices (14/19) are guarded by the Thebesian valve, which sometimes make placement of electrode difficult. The most commonly seen valves are a thin crescent structure hinged posterior-inferiorly, such that the orifice needs to be accessed from the anterior-superior direction. When broad band Thebesian valve is encountered, dexterous manipulation will be required for catheter placement, and selection of 5F electrode is better. Fenestrated Thebesian valve, which almost covering the whole orifice of the coronary sinus, it∞fs very difficult, if not possible, of delivery the coronary sinus electrode unless perforating the Thebesian valve.

[12]
OPTICAL MAPPING OF ATRIAL ARRHYTHMIAS IN THE INTACT MURINE HEART

S. BERNSTEIN, A. PATEL, G. MORLEY

NEW YORK UNIVERSITY, NEW YORK, USA

Previous animal models of thyrotoxicosis have suggested that decreased atrial refractory periods may be an important underlying mechanism of atrial fibrillation. We studied the effects of hyperthyrodism in murine atria. Electrophysiologic testing of Langendorff-perfused hearts was performed in two groups. One group consisted of 6 control mice that received injections of saline and the other consisted of 6 injected with levothryoxine (1 ug/gm/day) for three weeks. Baseline sinus rate in the control group was 330+/-13 bpm compared to 470+/-18 bpm in the levothyroxine-injected mice (p<0.001). Both right and left atrial refractory periods were significantly increased in the injected mice (15.8+/-2.8 vs 20.0+/-4.9 and 19.8+/-4.2 vs 30.2+/-4.9 ms, respectively, p<0.05). Conduction velocities were similar in both groups, and no atrial arrhythmias were induced in either group. To determine whether atrial arhhythmias are inducible in the intact murine heart in the absence of levothyroxine, we performed electrophysiologic testing on 12 normal hearts perfused with acetylcholine (ACh, 1mM). Baseline heart rate was 332+/-29 bpm and 57+/-23 bpm after ACh (p<0.0001). Atrial conduction velocity and refractory period were unchanged by ACh infusion. Programmed electrical stimulation of the atria was used to induce arrhythmias. A total of 7 episodes of atrial arrhythmia occurred in 3 ACh-infused hearts with an average duration of 10.3+/-7.6 s. The average tachycardia cycle length was 49+/-10 ms. In 5 episodes, regional dominant frequency analysis showed no significant difference in the right or left atria. In two episodes, complex atrial activation was observed with the dominant frequency located in the left atrium, suggesting atrial fibrillation. We conclude that the electrophysiologic response to thyrotoxicosis in the murine heart appears to be protective against atrial arrhythmias. Further studies are directed towards understanding the underlying electrophysiologic mechanisms as potential therapeutic interventions for atrial arrhythmias.

[13]
CARDIAC ALPHA-2 RECEPTORS – A POTENTIAL TARGET FOR TREATMENT OF VENTRICULAR ARRHYTHMIAS?

D. ARNAR[1], J. MARTINS[2]

[1]LANDSPITALI UNIVERSITY HOSPITAL, REYKJAVIK, ICELAND,
[2]UNIVERSITY OF IOWA HOSPITALS AND CLINICS, IOWA CITY, USA

The cardiac Purkinje system may play an important role in the genesis of ventricular tachycardia (VT) during ischemia. Previous data have shown that stimulation of post-junctional alpha-2 adrenoceptors in Purkinje fibers prevents induction of ischemic VT of Purkinje origin in a canine model and may therefore have an antiarrhythmic effect. Given this, we tested the hypothesis that alpha-2 adrenergic antagonism could facilitate induction of previously non-inducible VT during acute ischemia in an open chest animal model. The left anterior descending artery was occluded after instrumentation of the ischemic risk zone with 21 multipolar plunge needles, each recording 6 bipolar electrograms, including Purkinje potentials. Three dimensional mapping characterized the mechanism of VT induced with the programmed extrastimuli. Sixteen dogs were included. All had no inducible VT 1-2 hours after coronary artery occlusion. Eight animals were given the alpha-2 adrenergic antagonist yohimbine (0.075 mg/kg) and all animals had inducible VT after the drug, thereof six VT of Purkinje origin. Mean arterial pressure (MAP) (81+8 to 82+8 mm Hg, p=ns), ventricular effective refractory period (VERP) (146+6 to 144+5 ms, p=ns) and size of the ischemic zone (IZ) (55+6% vs 61+4%, p=0.45) were not altered by yohimbine indicating minimal central or pre-junctional effects of the drug. Eight dogs were given only saline. No VT was inducible in this group (p<0.05) during repeat extrastimulus testing and no change in MAP, VERP or IZ was seen. In conclusion, yohimbine facilitates induction of ischemic VT, especially of Purkinje origin, suggestive of an effect mediated through alpha-2 adrenoceptors on Purkinje fibers. This further suggests that post-junctional alpha-2 adrenoceptors on Purkinje fibers may have a role in modulation of ischemic VT. While ablation procedures have shown promise as therapy for this type of VT, alpha-2 receptors might be a potential pharmacological target for treatment of arrhythmias of Purkinje fiber origin.

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[14]
THE EFFECT OF EXERCISE ON CARDIAC DYSSYNCHRONY AND CARDIOPULMONARY PERFORMANCE IN HEART FAILURE PATIENTS

R. VEASEY[1], J. SILBERBAUER[1], L. BEALE[2], P. HONG[1], N. PATEL[1], N. SULKE[1], G. BRICKLEY[2], G. LLOYD[1]

[1]EAST SUSSEX HOSPITALS NHS TRUST, EASTBOURNE, UNITED KINGDOM; [2]CHELSEA RESEARCH INSTITUTE, UNIVERSITY OF BRIGHTON, EASTBOURNE, UNITED KINGDOM

Purpose Cardiac dyssynchrony at rest is associated with impaired exercise capacity and suggests likely response to cardiac resynchronisation therapy (CRT) in severe heart failure. Recent work has shown that cardiac dyssynchrony varies with physical activity. Further vwork is needed to understand how this affects exercise performance and response to CRT. We examined the effects of dynamic cardiac dyssynchrony on cardiopulmonary exercise performance in heart failure patients.
Materials and Methods 16 patients (age 72+/-9 years, 10 male), NYHA II-IV, LVEF <45% underwent maximal bicycle stress echocardiography and cardiopulmonary testing. Pulsed-wave tissue Doppler was taken in 6 LV walls at the level of the mitral annulus and the RV free wall at rest and immediately after exercise. Q wave to peak systolic velocities were analysed offline. Onset timings were adjusted on a beat-to-beat basis by dividing by the R-R interval for the heart rate-adjusted dyssynchrony indices. Inter-ventricular dyssynchrony was the delay between the RV and latest LV segment. The maximal dispersion in time between the 6 LV walls was termed the intra-LV dyssynchrony. Indices were adjusted for heart rate to allow comparison of rest and exercise dyssynchrony.
Results Interventricular dyssynchrony was 9.3±5.4 at rest and 10±6.1% at peak exertion (p=ns), 12 de-phased and 4 re-phased. Intra-LV dyssynchrony was 12.7±5.3 at rest and 12.7±5.2% at peak exertion (p=ns), 9 de-phased and 7 re-phased. Exertional velocity time integral was significantly related to resting (R2=0.39, p=0.01) and exertional (R2=0.34, p=0.02) intra-LV dyssynchrony. Peak VO2 was significantly related to the change in inter (R2=0.34, p=0.02) and intra-LV (R2=0.29, p=0.04) dyssynchrony from rest to exercise.
Conclusions This study suggests that increasing dyssynchrony may be responsible for worsening cardiopulmonary exercise performance in heart failure patients. Furthermore, a subgroup of patients without resting dyssynchrony develop dyssynchrony during exercise. This may have implications for patient selection and programming of CRT devices.

[15]
DEFINITION OF THE OPTIMAL AV DELAY IN CRT RECIPIENTS WITHOUT LIMITATIONS EVEN WITH SPONTANEOUS AV CONDUCTION

C. SUGA[1], B. ISMER[2], K. MATSUMOTO[1], R. KATO[1], Y. HOTTA[1], H. ISHIDA[1], M. UENISHI[1], T. TOBIUME[1], S. NISHIMURA[1]

[1]SAITAMA MEDICAL UNIVERSITY INTERNATIONAL MEDICAL CENTER, SAITAMA, JAPAN, [2]UNIVERSITY OF ROSTOCK, ROSTOCK, GERMANY

Purpose The purpose of this study was to establish novel optimal (O) AV delay (AVD) measurement without limitations in CRT recipients with spontaneous AV conduction.
Method This study included 10 CRT recipients. AVD is optimal when ventricular contraction begins coinstantaneously with end of atrial contraction. Therefore, we defined OAVD as follows. At the setout, AVD was configured to long AVD allowing spontaneous atrial contraction without interference of ventricular contraction. Intervals from atrial marker to beginning of A wave (1) and from beginning to end of A wave (2) were measured. Next AVD was configured to short AVD at which ventricular contraction interrupted atrial contraction. Interval from ventricular marker to end of A wave (3) was measured. Then "1+2-3" became calculated-OAVD as ventricular contraction induced mitral valve closure occurred coinstantaneously with end of atrial contraction. We assessed correlations between AVD which maximized aortic velocity-time-integral (VTI-OAVD) and QRS width, and calculated-OAVD.
Result Calculated-OAVD was 92.5+/-48.3 ms during atrial-sensing and 104+/-55.2 ms during atrial-pacing. Calculated-OAVD correlated with VTI-OAVD (r=0.892, p=0.0005) while VTI-OAVD did not correlate with QRS width.
Conclusion OAVD can be determined accurately by our method even in CRT recipients with spontaneous AV conduction.

[16]
THE PREDICTOR FOR NON-RESPONDERS IN PATIENTS UNDERGOING CARDIAC RESYNCHRONIZATION THERAPY

C. SUGA, K. MATSUMOTO, R. KATO, T. TOBIUME, Y. HOTTA, M. UENISHI, H. ISHIDA, S. NISHIMURA

SAITAMA MEDICAL UNIVERSITY INTERNATIONAL MEDICAL CENTER, SAITAMA, JAPAN

Introduction A proportion of patients undergoing cardiac resynchronization therapy (CRT) becomes non-responder (NR). The purposes of this study were to evaluate the differences between responder (R) and NR and also to determine the predictor for NR in CRT recipients.
Method This study consisted of 39 transvenously implanted CRT recipients (29 Males, mean age 63.0+/-15.6 years). Patients were divided to responders (R; LVESV reduction >15% was confirmed at 6month after implantation) and non-responders (NR; LVESV reduction was not confirmed at 6 months after implantation). We compared patient characteristics before CRT implantation between 2 groups. Multivariate analysis was performed to determine the independent predictors for NR.
Result There were significant differences (p<0.05) between R and NR in number of heart failure hospitalizations (2.0+/-1.2 vs 3.1+/-1.2), serum BNP level (681.1+/-509.0 vs 1590.2+/-1107.0 [pg/ml]), LVEDD (62.3+/-10.4 vs 71.4+/-8.9 [mm]), LVESD (53.7+/-10.5 vs 61.6+/-10.0 [mm]), and LVEF (27.7+/-6.8 vs 23.0+/-6.9 [%]) whereas no significant differences were found in age, gender, NYHA class and QRS width (p=NS). LVEDD was the only independent predictor for NR (OR 0.34, p<0.05, 95% CI 0.12-0.967).
Conclusion Severity of heart failure and LV remodeling was relatively mild in R compared to NR. CRT benefit can not be promising in patients with seriously disturbed and remodeled LV function. Especially, LVEDD was the predictor for NR to CRT.

[17]
EFFECT OF CHANGES IN THE ATRIOVENTRICULAR DELAY ON RIGHT VENTRICULAR ELECTROMECHANICAL DELAY IN HEART FAILURE PATIENTS RECEIVING CARDIAC RESYNCHRONISATION THERAPY

M. STÅHLBERG[1], M. DAMGAARD[2], P. NORSK[2], A. GABRIELSEN[1], C. LINDE[1], F. BRAUNSCHWEIG[1]

[1]KAROLINSKA UNIVERSITY HOSPITAL, STOCKHOLM, SWEDEN; [2]RIGSHOSPITALET, COPENHAGEN, DENMARK

Purpose The purpose of this study was to investigate the effect of different atrioventricular delays (AVD) on right ventricular (RV) pressures and electromechanical delay.
Materials and Methods Eight heart failure patients implanted with a CRT device as well as an implantable hemodynamic monitor

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(Chronicle® Model 9520, Medtronic Inc., USA) were investigated. RV systolic blood pressure (sBP), diastolic blood pressure (dBP), estimated pulmonary arterial diastolic pressure (ePAD), dP/dt, systolic time interval and pre ejection interval was measured in three different AVD (optimal according to the Ritter method, optimal – 40 ms and optimal +40 ms). Right ventricular electromechanical delay was defined as the time interval between the sensing signal in the RV and maximal dP/dt in the pressure wave form.
Results RV sBP and dBP systolic as well as maximal dP/dt were unchanged with different AVD programming. Right ventricular filling pressures were slightly but significantly lower at opt AVD and opt AVD + 40 ms compared to opt AVD -40ms (23±8 mm Hg at opt -40 ms; 22±8 at opt and 22±8 at opt +40 ms; p<0,05 opt/opt+ vs opt-). Right ventricular electromechanical delay shortened with prolonged AVD (139±31 ms at opt -40ms, 130±31 at opt and 119±20 at opt +40 ms, p<0,05 comparing opt -40 ms with opt +40 ms and opt with opt +40 ms; p=0,06 comparing opt and opt -40 ms.
Conclusions In this study AVD prolongation reduced cardiac filling pressures and shortened the right ventricular electromechanical delay in heart failure patients receiving CRT. The hemodynamic information from an implanted monitor may be useful to optimize pacemaker programming.

[18]
THE HEMODYNAMIC EFFECT OF DIFFERENT ATRIOVENTRICULAR DELAYS IS LARGER IN STANDING COMPARED TO SUPINE BODY POSITION IN PATIENTS RECEIVING CARDIAC RESYNCHRONIZATION THERAPY

M. STÅHLBERG[1], M. DAMGAARD[2], P. NORSK[2], A. GABRIELSEN[1], C. LINDE[1], F. BRAUNSCHWEIG[1]

[1]KAROLINSKA UNIVERSITY HOSPITAL, STOCKHOLM, SWEDEN; [2]RIGSHOSPITALET, COPENHAGEN, DENMARK

Purpose AV-delay (AVD) optimization is commonly performed in the resting, supine patient. The hemodynamic impact of AVD programming in different body positions or during exercise is not known. This study investigated the effect of different AVD on cardiac output (CO) in different body positions at rest and during a limited steady state bicycle exercise.
Materials and Methods Twenty seven heart failure patients receiving Cardiac Resynchronization Therapy (CRT) participated in this study. Eight patients without heart failure and a pacemaker for AV-block III served as controls. The effect of 3 different AVDs (optimal according to the Ritter method, optimal -40 ms and optimal +40 ms) on CO was investigated, using an inert gas rebreathing technique (Innocor®, innovision, DK). Patients were assessed in left lateral- (LLP), horizontal supine- (SUP), seated- (SEAT) and standing (STA) body position at rest as well as during a limited steady state bicycle exercise (EXE).
Results AVD programming had similar effects in terms of absolute changes of CO in all body positions in both groups. Due to a drop in CO, there was a significantly higher % change of CO in the standing body position compared to SUP, SEAT and EXE (14,0% at STA vs 8,5% at SUP, 6,8% at SEAT and 6,3% at EXE, p<0,05). Between group analysis showed a trend towards a higher relative impact of changes in AVD on CO in the CRT group compared to controls (14,0% vs 5,6%, p=0,08).
Conclusions The percentage effect of changes in AVD on cardiac output is higher in the standing patient than during supine body position or exercise in heart failure patients receiving CRT.

[19]
DIAPHRAGMATIC MYOPOTENTIAL OVERSENSING IN PACEMAKER DEPENDENT PATIENTS WITH CRT-D DEVICES

K. REIS SANTOS[1], P. ADRAGÃO[1], D. CAVACO[1], F. MORGADO[1], R. CANDEIAS[2], S. LIMA[1], A. SILVA[1]

[1]HOSPITAL DE SANTA CRUZ, CARNAXIDE, PORTUGAL; [2]HOSPITAL DE FARO, FARO, PORTUGAL

Purpose Pacemaker (PM) dependent patients with CRT-Ds may be particularly vulnerable to diaphragmatic myopotential (dMP) oversensing. They may be more predisposed to this type of complication because defibrillators have a dynamic sensing that increases the risk of dMP oversensing, particularly during pacing. And, being PM dependent, they are also more vulnerable to the clinical consequences of oversensing: inappropriate ventricular tachycardia/fibrillation detection and therapy and pacing inhibition. The purpose of this study was to retrospectively evaluate the prevalence and clinical significance of dMP oversensing in this population.
Methods and Results We retrospectively evaluated all patients with CRT-Ds implanted between Jan/2000 and Aug/2006. Patients that were or become PM dependent were identified. In this population the prevalence of inappropriate arrhythmia detections due to dMP oversensing was determined and their possible clinical implications (inappropriate therapies, syncope and death of all cause) were evaluated. 126 CRT-Ds were implanted in 121 patients. 36 were or become PM dependent during follow-up, 20 in consequence of an AV node ablation. During a mean follow-up of 23±16 months, 7 CRT-D generators in 7 (19,4%) PM dependent patients revealed inappropriate detections due to dMP oversensing. All oversensing episodes occurred in patients with generators with automatic gain control (AGC) sensing and integrated bipolar leads (IBP); none had septal RV defibrillator leads. These detections led to inappropriate shocks in 2 (5,6%) patients and syncope in 1 (2.7%). 4 (11.1%) patients died. None of the deaths occurred in patients with previously detected oversensing episodes.
Conclusion Diaphragmatic MP oversensing in PM dependent patients with CRT-D devices is an important problem, particularly in CRT-Ds with AGC sensing and IBP leads, where over one fifth reveal inappropriate detections. The clinical impact of dMP oversensing is less marked but still relevant, with both inappropriate therapies and syncope occurring in this small group of patients.

[20]
INCIDENCE OF ATRIAL FIBRILLATION IN PATIENTS WITH VDD AND DDD BIVENTRICULAR SYSTEMS IMPLANTED FOR CARDIAC RESYNCHRONIZATION THERAPY

S. PESCARIU, D. BRIE, D. POPA, D. MAXIMOV, A. IONAC, C. MORNOS, C. ERIMESCU, M. SLOVENSKI, S. DRAGULESCU

INSTITUTE OF CARDIOVASCULAR DISEASE, TIMISORA, ROMANIA

Background VDD biventricular paced rhythm is an effective simplified feasible technique in patients (pts) with CHF and preserved atrial function due to shortness of radiological exposure time, decreased risk of leads dislodgements and cost effectiveness. An inherent limitation of single lead VDD pacing is the inability to stimulate the atria but the advantage is the preservation of normal atrioventricular conduction.
Purpose To evaluate the incidence of atrial fibrillation (AF) in patients with right-atrial-paced (DDD) and right-atrial- sensed (VDD) biventricular paced rhythm for cardiac resynchronization therapy (CRT).
Methods Between 2003-2006, 52 pts were implanted with biventricular pacemaker for CRT:group A-24 pts with VDD system (17 males, mean age=66±11 years) and group B-28 pts with DDD system (18 males, mean age=62±9 years). All patients were in NYHA class III

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despite standard pharmacological therapy, had a LVEF <35%, a QRS duration of at least 120 ms (patients with a QRS interval of 120 to 149 ms required additional echocardiographic criteria for dyssynchronism), left atrial diameter <5 cm, normal RA volume and no history of atrial tachyarrhythmia. For AF detection were used diagnostic memory functions of device and ECGs performed to follow-up visits or unplanned hospitalization related to AF.
Results By the end of the study (mean duration of follow-up 20±6 months), episode of AF had been documented in 5 pts (21%) in group A and 7 pts (25%) in group B (p=0.59). Permanent atrial fibrillation despite the pharmacological and electrical treatment was 2 pts (8,33%) from group A and 3 pts (10,7%) from goup B (p=0.79).
Conclusion Follow up period relieve no significant differences in incidence of AF and in improvement of left ventricular function between VDD and DDD biventricular systems implanted for CRT. It is safe to use VDD biventricular system in patients with preserved atrial function and no history of atrial tachyarrhythmias.

[21]
MYOCARDIAL CONNECTIONS BETWEEN THE LIGAMENT OF MARSHALL AND CARDIAC CHAMBERS IN HUMAN HEARTS: A MORPHOLOGIC STUDY WITH IMPLICANCIES FOR CATHETER ABLATION

Á. RIVARA[1], S. LAZA[2], M. POUMAYRAC DE MASREDON[2], B. VILLAR[3], N. DELEON[3], M. VERGARA[2], D. FREIRE[1], A. CIRILLO[3], P. DE LOS SANTOS[2], R. LLUBERAS[1], V. SORIA[2]

[1]HOSPITAL DE CLÍNICAS, FACULTAD DE MEDICINA MONTEVIDEO, URUGUAY; [2]DEPARTAMENTO DE ANATOMÍA, FACULTAD DE MEDICINA, MONTEVIDEO, URUGUAY; [3]DEPARTAMENTO DE HISTOLOGÍA, FACULTAD DE MEDICINA, MONTEVIDEO, URUGUAY

Background The Ligament of Marshall (LOM) is a source of cardiac arrhythmias. Complete morphologic aspects of the LOM and connections with other arrhythmogenic structures have not been described in human hearts.
Method Sixty five post-mortem fixed human hearts were analyzed. The LOM and adjacent structures were dissected along its extension. Presence, relationships and content of the LOM were studied. Presence and distribution of myocardial sleeves (MS) and their connections to the cardiac chambers and coronary sinus (CS) were analyzed. Histologic examination was performed in blocks of tissue encompassing the LOM.
Results The LOM, Marshall vein and MS were present in all cases. Cardiac nerves were present in 63 of 65 cases. MS into the LOM were constant. At the subepicardial surface of the mitral isthmus, the LOM was connected with the left atrial muscle through MS coming from the left atrial appendage. MS from the LOM surrounding the CS up to its ostium were found in all cases. These MS extended beyond the CS ostium towards the cavotricuspid isthmus (CTI), where they ended in several branches.
Conclusions The presence, structure, and distribution of MS in the LOM were constant. MS connecting to the CS, LA, and RA were always present. Connections between the LOM and cardiac chambers could have implications for catheter ablation procedures.

[22]
ECG DISCRIMINATION OF ATRIAL TACHYCARDIAS ORIGINATING FROM THE LEFT VERSUS RIGHT PULMONARY VEINS IN PATIENTS AFTER AF ABLATION

A. PATEL, A. AIZER, D. HOLMES, A. GARLITSKI, J. SWINGLE, S. BERNSTEIN, N. BERNSTEIN, L. CHINITZ

NEW YORK UNIVERSITY MEDICAL CENTER, NEW YORK, USA

Introduction Focal or microrentry atrial tachycardias (AT) after AF ablation often originate from the right or left pulmonary veins (RPVs or LPVs). Since these ATs are frequently non-sustained, knowledge of the site of origin in advance may improve success during AT ablation. To date no ECG criteria have been identified to localize ATs post AF ablation. We attempted to derive an ECG algorithm for the discrimination of focal ATs originating from RPVs versus LPVs in patients who underwent standardized AF ablation.
Methods We identified all patients referred for AT ablation after AF ablation. Patients with identical ablation lesion sets were compared. Focal ATs were identified and localized with activation and entrainment mapping. Patients were included only if tachycardia terminated with ablation. ECGs were analyzed by an electrophysiologist blinded to AT location. Each lead was scored as positive, negative, biphasic, or flat. Sensitivity, specificity, positive predictive value, and negative predictive value was calculated for each discriminator. An algorithm was derived to discriminate focal AT origin.
Results Seventeen patients were identified with ATs (11 from LPVs, 6 from RPVs). All patients underwent circumferential ablation, pulmonary vein isolation, and linear roof lesion. ECG analysis identified four discriminators which localized the site of origin of atrial tachycardia. Combining 2 of the discriminators correctly localized the site of AT in all patients in our cohort. Evaluation of p wave morphology as flat or biphasic in lead I and in lead avL allowed for localization of AT in all patients. This algorithm accurately discriminates ATs in patients with and without cavo-tricuspid isthmus ablation.
Conclusions We identified an accurate ECG algorithm for discrimination of focal AT origin in patients with a prior standardized AF ablation.

[23]
OVERWEIGHT AND OBESITY PREDICT LATE RECURRENCE OF ATRIAL FIBRILLATION AFTER CATHETER ABLATION

R. TANG, J. DONG, X. LIU, J. KANG, D. LONG, R. YU, F. HU, X. LIU, C. MA

ANZHEN HOSPITAL, CAPITAL MEDICAL UNIVERSITY, BEIJING CHINA

Objective To investigate the impact of overweight and obesity on the late recurrence of atrial fibrillation (AF) after catheter ablation.
Methods From January 2005 to July 2006, consecutive patients with AF underwent circumferential pulmonary vein ablation guided by 3-D mapping system were enrolled in the retrospective study. Late recurrence was defined as atrial tachyarrhythmia lasting more than 30 seconds beyond one month washout period. Overweight and obesity was diagnosed by body mass index ¡?25.0 kg/m2.
Results Among the 369 patients, 199 patients had overweight and obesity (53.9%). The left anterior-posterior diameter of left atrium and the end-diastolic diameter of left ventricule was significantly larger in the overweight and obesity arm than that in the another arm (40.2¡À6.0 mm vs 36.6¡À6.5 mm£¬ P<0.001; 49.1¡À7.1 mm vs 46.9¡À6.6 mm£¬ P=0.003, respectively). After mean 459¡À181 days follow-up, the incidence of late recurrence was significantly higher in the overweight and obesity arm (40.2% vs 25.9%, P=0.004). Univariate analysis showed overweight and obesity, non-paroxysmal AF, left atrium size and left ventricular end-diastolic diameter were predictors of the recurrence. Adjusted for AF duration, non-paroxysmal AF, hypertension and structural heart disease, Cox regression analysis revealed that

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overweight and obesity was an independent predictor of late recurrence (Hazard ratio 1.67, 95% Confidence Interval 1.13-2.46, P=0.009). Further adjusted for left atrium size and left ventricular end-diastolic diameter, only the left atrium size was an independent predictor of the recurrence (Hazard ratio 1.04, 95% Confidence Interval 1.01-1.08, P=0.010).
Conclusion Overweight and obesity have great impact on the recurrence of catheter ablation of AF, it is probably mediated by left atrium size.
Key words Overweight; Obesity; Atrial fibrillation; Catheter ablation; Recurrence.

[24]
ELECTROPHYSIOLOGY AND CATHETER ABLATION OF ATRIAL FIBRILLATION IN PATIENTS WITH OBESITY

S. CHANG[1], C. TAI[2], Y. LIN[2], L. LOW[2], S. CHEN[2]

[1]SUAO VETERAN HOSPITAL, YI-LAN, TAIWA; [2]TAPEI VETERAN GENERAL HOSPITAL, TAIPEI, TAIWAN

Background Previous studies have reported that obesity is highly associated with the development of atrial fibrillation (AF). However, its impact on the atrial substrate property and catheter ablation in patients with AF is still unclear.
Methods Bi-atrial electroanatomic mapping using a 3-dimensional mapping system (NavX) was performed in 123 patients (age 50±12 years old, 93 male) with AF (24 persistent and 99 paroxysmal). Patients were divided on the basis of BMI (kg/m^2) into 4 groups: BMI <22 kg/m^2 (underweight), 22<=BMI<=25 kg/m^2 (normal), 25<BMI<=30 kg/m^2 (overweight), BMI >30 g/m^2 (obese). Bi-atrial bipolar voltage, total activation time (TAT), and low voltage area (LVZ) index (the low voltage surface area/total surface area of atrium) were measured.
Results Patients with obesity had a lower LA voltage (0.8±0.3, 1.5±0.5, 1.7±0.5, 1.9±0.3 mV, for obese, overweight, normal, and underweight respectively, P<0.001), longer LA TAT (103±21, 92±14, 86±15, 85±12 ms, P=0.01) and higher LVX index of LV (25±11%, 12±11%, 12±10, 10±9%, p=0.04). Patient with BMI >25 had a higher incidence of inducible atrial tachyarrhythmia (42%, 13%, 15%, P=0.003) and recurrence of AF (46%, 28%, 15%, P=0.03) than those with normal and underweight. Patients with BMI >25 had a higher incidence of non-PV foci recurrence than those with BMI<=25 (58% vs 19%, P=0.04).
Conclusion Obesity is associated with lower LA voltage and could affect the outcome of AF ablation. Non-PV foci play an important role in the recurrence of AF after catheter ablation in patients with BMI >25.

[25]
INFLUENCE OF THE PLACEMENT OF THE PACEMAKER VENTRICULAR LEAD ON POST-IMPLANTATION HEMODYNAMIC ECHOCARDIOGRAPHIC PARAMETERS

A. DRZEWIECKA[1], R. MLYNARSKI[1], W. KARGUL[1], E. DRZEWIECKA[2]

[1]ELECTROCARDIOLOGY DEPARTMENT, MEDICAL UNIVERSITY OF SILESIA, KATOWICE, POLAND; [2]MEDICAL UNIVERSITY OF SILESIA, SOSNOWIEC, POLAND

Echocardiography is a valuable method which can indirectly resolve controversies on the optimal placement of the endocardial ventricular leads by evaluating cardiac function. PURPOSE: to evaluate influence of the localization of the right ventricle lead on hemodynamic echocardiographic parameters assessed by a selected echocardiographic parameters.
Methods 97 patients with SND and normal heart contraction (EF >55%; MPI <0,4), qualified for pacemaker implantation were included and next randomly divided into 4 groups: right ventricular outflow tract (RVOT), apex, subvalvular and inter ventricular septum (IVS). According to the randomized place active fixation ventricular leads were implanted. Excluded were patients in which it wasn't possible to obtain the previously random place of the implantation of the ventricular lead due to technical/electrical problems. In each patient a DDD pacemaker were implanted. A full echo were performed twice: 1. on sinus and 2. on pacing rhythm (VDD on short AV-delay 80 ms). Such echo parameters were evaluated as: LV ejection fraction (LVEF) and myocardial performance index (MPI).
Results LVEF in the group of RVOT increase at value 4,23±3,55% (p=0,000) and in group IVS (1,60±3,99%; p=0,018). Reduction of LVEF was observed in group of apex (1,78±5,94%; p=0,055; NS) and subvalvular group (4,86±5,37%; p=0,026). MPI decrease in the group of RVOT (0,06±0,11; p=0,001) and in the group IVS (0,03±0,13; p=0,106). Increase of MPI was observed in group of apex (0,17±0,14; p=0,000) and subvalvular group (0,18±0,27; p=0,060; NS).
Conclusions Significant improvement of LV function was observed in the groups RVOT and IVS. Deterioration of LV function was observed in groups apex and subvalvular. According to the results RVOT and IVS seems to be optimal place of ventricular leads implantation. MPI and LVEF are good echo parameters to evaluation of LV function in the group of patients with previously implanted pacemakers.

[26]
ECHOCARDIOGRAPHIC FACTORS RESPONSIBLE FOR IMPROVEMENT OF HEALTH RELATED QUALITY OF LIFE IN PATIENTS AFTER PACEMAKER IMPLANTATION

R. MLYNARSKI, E. PILAT, A. DRZEWIECKA, R. GARDAS, W. KARGUL

ELECTROCARDIOLOGY DEPARTMENT, MEDICAL UNIVERSITY OF SILESIA, KATOWICE, POLAND

There is no research explaining what echocardiographic factors can determine an improvement of health related quality of life (HRQL) in patients with pacemakers.
Purpose to analyze which echo parameters correlate with the strongest improvement of HRQL.
Methods 198 patients (age 71,3±8,7) qualified for pacemaker implantation (AV Blocks: 100; SND: 98) were included into the study. In all patients a DDD pacemakers were implanted: the ventricular lead was implanted to the RVOT (87,4%) and the atrial lead to the cardiac auricle. None of the special functions for the pacemaker model were activated. In each case 2 echo examinations, as well as a HRQL evaluation (MLWHF) were performed (before and 6 months after implantation). All echo measurements were performed 3 times and average results were entered into the database. Full programming, including AV-delay optimalization was performed 3 days after implantation. Average ventricular pacing in SND was 38%. Patients with other serious illnesses which could interfere with the results of HRQL were excluded. Results of echo examinations before implantation were correlated with HRQL changes (evaluated as HRQL results 6 month after minus QoL result before implantation).
Results In all patients overall improvement of HRQL after 6 months was observed. There were significant correlations such echo parameters as: aortic valve regurgitation in both analyzed groups (SND: r=0,187/p=0,033; AVB: r=0,195/p=0,026) and TAPSE - tricuspid annular plane systolic excursion in AVB (r=-0,169, p=0,047). Correlation for TAPSE in SND group was almost statistical – trend visible (r=-0,160, p=0,058; NS). Patients 6 months after implantation have a significantly lower value of TAPSE (20,2±5,1 mm before vs 18,4±3,9 mm after; p<0,05).
Conclusions Lack of significant aortic valve regurgitation and high values of TAPSE before pacemaker implantation seems to be a very

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good predictor factors for quality of life improvement in patients qualified to pacemaker implantation.

[27]
RIGHT VENTRICULAR MIDSEPTAL PACING AND VENTRICULAR DYSSYNCHRONY: MIDTERM FOLLOW-UP

K. LEFFLEROVA, J. KAUTZNER, P. LUPINEK, T. MAREK, J. BYTESNIK, R. CIHAK, R. KRAUSOVA, V. VANCURA

DEPARTEMENT OF CARDIOLOGY, IKEM, PRAGUE, CZECH REPUBLIC

Purpose Right ventricular (RV) apical pacing results in cardiac dyssynchrony and may compromise hemodynamic function of the left ventricle (LV). Alternative right ventricular pacing sites have been suggested as an approach to achieve physiologic activation of LV. The goal of this study was to assess midterm effect of septal pacing on echocardiographic parameters of ventricular dyssynchrony in patients with preserved LV systolic function.
Methods 26 patients (18 males, mean age 73±10 years) with advanced AV block and LV ejection fraction >45% were included. A screw-in bipolar lead was systematically positioned in RV midseptum. Echocardiography, including Doppler tissue imaging (TDI) analyses was performed within one week after implantation and after six months of follow-up. Indexes of inter- and/or intraventricular dyssynchrony were evaluated. Interventricular mechanical delay (IVMD) was assessed using pulsed wave Doppler as he difference between left and right ventricular preejection interval). Intraventricular LV dyssynchrony was analyzed from TDI data. The septal - to - lateral delay was measured as the time difference of onset, respectively peak systolic velocities. Ventricular pacing was documented in >90% during baseline and follow-up.
Results Left ventricular preejection interval at baseline 141±22 ms, at follow-up 147±23 ms P - value ns.
Right ventricular preejection interval at baseline 114±33 ms, at follow-up 121±24 ms P - value ns.
Interventricular mechanical delay at baseline 21±23 ms, at follow-up 21±18 ms P- value ns.
Septal-lateral delay onset at baseline 8±31 ms, at follow-up 17±42 ms P - value ns.
Septal-lateral delay peak at baseline 27±59 ms, at follow-up 21±56 ms P - value ns.
Conclusion Mideptal position of the RV lead in patients with preserved LV systolic function does not result in significant interventricular and/or intraventricular dyssynchrony over a period of 6 months.
The study is supported by the grant project IGA MZCR NR 8553-3/2005.

[28]
ATRIAL AND VENTRICULAR STRUCTURAL REMODELING AFTER DEPENDENT CAVOTRICUSPID ISTHMUS FLUTTER ABLATION

J. GARCIA SEARA, B. CID ALVAREZ, L. MARTÍNEZ SANDE, R. VIDAL PÉREZ, F. SOTO LOUREIRO, E. GONZALEZ BABARRO, M. GUTIERREZ FEIJOO, M. VEGA FERNANDEZ, J. GONZALEZ JUANATEY

CLINICAL HOSPITAL OF SANTIAGO DE COMPOSTELA, SANTIAGO DE COMPOSTELA, SPAIN

Purpose To evaluate cardiac morphological changes after dependent cavotricuspid isthmus atrial flutter ablation (DCIAF).
Material and Methods We analized prospectively 56 patients diagnosed with AF. 53 pts. (94.6%) were DCIAF, 2 (3.5%) left atrial flutter and 1 (1.7%) right anterolateral flutter. 12 pts. (21.4%) did not have structural heart disease. The most frequent heart disease associated was hypertensive cardiopathy 20 pts. (35.7%). 10 pts. (17.9%) had symptoms of heart failure, 15 pts. (26.8%) had tachycardiomyopathy. We performed an echocardiographic examination in all patients at baseline and at 1 year follow-up and determined the following parameters: right atrial area (RAA), left atrial area (LAA), interventricular septum wall thickness (IVS), posterior wall thickness (PW), left ventricular diastolic diameter (LVDD), left ventricular systolic diameter (LVSD), left atrial dimension (LAD) and ejection fraction (EF) We analysed the variation coefficient (VC) interobserver and intraobserver Statistical analysis was performed using Wilcoxon test
Results Interobserver VC mean was in the range of 2.3%-4.5%. Intraobserver VC mean was in the range of 0.83%-5.6%. RAA: 65,9% pts. improved with a mean of decrease (MD) of -4.20 cm2 and standard deviation (SD) 6.2, p<0,000, LAA: 59.5% pts improved with a MD of -0,99 cm2 and SD 7,1, p<0,29. LAD: 47,9% pts. improved with a MD of -0,07 cm and SD of 0,59, p<0,46. IVS: 57.1% pts.improved with a MD of -0.08 cm and SD of 0.24, p<0.05. PW:50% pts. improved with a MD of -0.05 cm and SD of 0.01, p<0.25. LVDD: 60% pts. improved with a MD of -0.23 cm and SD of 0.55, p<0.04. LVSD: 67.5% pts. improved with a MD of -0.43 cm and SD of 0.77, p<0.003. EF: 70% pts.improved with a mean of increase of + 8.78% and SD (14.77), p<0.002
Conclusions DCIAF ablation causes an inverse remodeling of right atrial area and left ventricle dimensions and a strong improvement of left ventricular ejection fraction.

[29]
MYOCARDIAL PERFORMANCE INDEX AND LEFT VENTRICULAR DYSSYNCHRONY

F. CABRERA-BUENO, J. GARCIA-PINILLA, J. PEÑA-HERNANDEZ, M. JIMENEZ-NAVARRO, J. GOMEZ-DOBLAS, A. BARRERA-CORDERO, J. ALZUETA-RODRIGUEZ , E. DE TERESA-GALVAN

HOSPITAL UNIVERSITARIO VIRGEN DE LA VICTORIA, MALAGA, SPAIN

Introduction In spite of the widespread use of cardiac resynchronization therapy (CRT), up to 30% of patients do not respond to it, therefore the criteria to identify which patients (P) with heart failure (HF) would benefit more from CRT, is continuously being reviewed.
Objective To analyze what proportion of P those qualify for CRT, do not present echocardiographic criteria of dyssynchrony, but constitute a population with different characteristics; as well as to analyze the response after CRT.
Methods Prospective study of patients with HF who met CRT criteria and were sent for echocardiogram to define which parameters would be related to the presence of intraventricular, interventricular and atrio-ventricular dyssynchrony. Echocardiographic response after CRT was also analyzed.
Results Forty-five patients were included (62±11 years). The average QRS was 165±18 ms, and 31.1% showed ischemic etiology. 31 P (68.9%) presented intraventricular, 29 (64.4%) interventricular and 11 (24.4%) atrio-ventricular dyssynchrony. P with intraventricular and interventricular dyssynchrony displayed a worse Myocardial Performance Index (MPI) (1.12±0.18 vs 0.88±0.11; p<0.001; and 1.12±0.18 vs 0.91±0.14, p=0.003). No differences were found in the rest of the clinical and echocardiographic parameters analyzed (diameters, volumes, ejection fraction, left ventricular size, mitral regurgitation, pulmonary pressure, and transmitral filling pattern), neither when analyzing atrio-ventricular dyssynchrony.
CRT was performed in 30 patients. Significant improvement was observed of the MPI (0.78±0.13 vs 1.11±0.18; p=0.037), end-systolic left ventricular volume (ESV) (77.5±39.9 vs 102.0±42.4 ml/m2; p=0.021) and EF (30.4±8.0 vs 21.7±6.6%; p=0.050).
Conclusions 1. More than 30% of patients, who met criteria for CRT according to the clinical guidelines, do not present echocardiographic parameters of dyssynchrony. 2. The echocardiographic parameters

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of dyssynchrony identified patients with worse MPI. 3. CRT is associated to improvement of the MPI, ESV and EF.

[30]
EXPERIENCE WITH CARDIOVERTER-DEFIBRILLATOR IMPLANTATION IN PATIENTS WITH HYPERTROPHIC CARDIOMYOPATHY

K. POLYMEROPOULOS[1], V. VASSILIKOS[2], G. EFTHIMIADIS[2], S. PARASKEVAIDIS[2], E. DALAMANGA[2], V. PAPAVASSILIOU[2], S. MOCHLAS[2], I. STYLIADIS[2], G. PARCHARIDIS[2]

[1]G. PAPANIKOLAOU HOSPITAL, THESSALONIKI, GREECE; [2]AHEPA UNIVERSITY HOSPITAL, THESSALONIKI, GREECE

Purpose To assess the outcome of Implantable Cardioverter-Defibrillator (ICD) implantation in Hypertrophic Cardiomyopathy (HCM). Patients and methods We studied 34 HCM patients implanted with an ICD (20 male, mean age 53±18 years). The indication was secondary prevention of SCD in 8 patients (group A, 24%) and primary prevention (necessitating at least two risk factors) in 26 (group B, 76%).
Results The mean follow-up period was 33 months (range 3-59). During this period 7 patients (21%) received appropriate ICD therapies; 3 patients in group A (37% - 2 experienced shock for VF and 1 exhibited antitachycardia pacing-ATP for VT) and 4 in group B (15% - two experienced shock for VF and two received ATP for VT). 8 patients (24%) received at least one inappropriate ICD shock; 2 in group A (both due to atrial fibrillation) and 2 in group B (due to atrial fibrillation and artifacts caused by lead fracture).
Conclusions The high appropriate discharge rate in patients with HCM confirms the substantial role of ICD therapy, especially in secondary prevention, even though the inappropriate interventions should not be disregarded.

[31]
LONG-TERM MORTALITY IN PATIENTS WITH CHRONIC HEART FAILURE AND IMPLANTABLE CARDIOVERTER/DEFIBRILLATOR

J. SIEBERMAIR, C. SCHUKRO, G. STIX, J. KASTNER, T. PEZAWAS, M. WOLZT, H. SCHMIDINGER

MEDICAL UNIVERSITY OF VIENNA, VIENNA, AUSTRIA

Background Implantable cardioverter/defibrillators (ICD) have become a cornerstone therapy for primary and secondary prevention of sudden cardiac death by ventricular arrhythmias.
The degree of left ventricular impairment is an important prognostic marker of long-term outcome. The aim of this study was either to investigate mortality in patients with reduced LVEF (<=35%) vs normal LVEF and, especially for patients with impaired LVEF, mortality rates in ischemic cardiomyopathy (iCMP) vs non-ischemic cardiomyopathy (non-iCMP).
Methods Between June 1988 and October 2006, 947 patients underwent ICD implantation in our institution (82% male; age at implantation 58.9±13.6 years), of which 34 were lost to clinical follow-up after implantation (3.6%). Data on LVEF and mortality were available in 877 patients. In the collective with impaired LVEF (438 patients), 333 suffered from iCMP (76%) and 105 from non-iCMP (24%).
Results Within a follow-up period of 51±44 months, overall mortality was 31.8% (290 patients, of which LVEF was not available in 11 patients). Mortality of patients with impaired LVEF was 186/438 (42.5%), while it was 93/439 (21.2%) in patients with normal LVEF ($p<0.001$). 5 and 8 year mortality rates were 36% and 67.2% in patients with reduced LVEF compared to 17.6% and 42.1% in patients with normal LVEF ($p<0.001$), respectively. In the collective with impaired LVEF, mortality among patients with iCMP was 151/333 (45.3%) while it was 35/105 (33%) in patients with non-iCMP. 5 and 8 year mortality rates were 36% and 54.1% in patients with iCMP whereas subjects with non-iCMP showed mortality rates of 27.6% and 52% (p=NS), respectively.
Conclusions Although there were highly significant differences in long-term mortality between patients with impaired and normal LVEF, mortality rates between patients with iCMP and non-iCMP did not differ significantly.

[32]
INCIDENCE OF APPROPRIATE AND INAPPROPRIATE INTERVENTIONS BY IMPLANTABLE CARDIOVERTER/DEFIBRILLATORS

C. SCHUKRO, J. SIEBERMAIR, G. STIX, J. KASTNER, T. PEZAWAS, M. WOLZT, H. SCHMIDINGER

MEDICAL UNIVERSITY OF VIENNA, VIENNA, AUSTRIA

Background Implantable cardioverter/defibrillators (ICD) are today's therapeutic option for primary and secondary prevention of sudden cardiac death by ventricular arrhythmias. Data about the incidence of appropriate and inappropriate (e.g. due to atrial fibrillation, T-wave oversensing or artefacts by electrical interference) ICD interventions still remain contradictory.
Methods The aim of this single center retrospective analysis was to investigate the "real world" incidence of ICD interventions in an overall collective. ICD interventions were defined by shocks and antitachycardic pacing. Moreover, we differentiated between successful and unsuccessful (i.e. non-termination of the arrhythmia by ICD intervention) appropriate shocks.
Results Between June 1988 and October 2006, ICD were implanted in 947 patients (82% male; age at implantation 58.9±13.6 years, range 4 – 90 years), of which 34 lost to clinical follow-up after implantation (3.6%). Within a follow-up period of 51±44 months in the remaining 913 patients, overall mortality was 32.7% (299 patients). Appropriate ICD interventions were recorded in 452 patients (49.5%). Only 303 patients (33.2%) needed appropriate (and successful) shocks, whereof also unsuccessful shocks were found in 72 patients (7.9%). Overall 209 patients (22.9%) underwent inappropriate shocks, whereof 112 patients (12.3%) suffered from inappropriate shocks without the need for any appropriate ICD intervention. Inappropriate ICD interventions without the need for any appropriate interventions were recorded in 137 patients (15.0%).
Conclusions As inappropriate shocks were reported to impair seriously quality of life, and as inappropriate ICD interventions increase the risk for induction of ventricular arrhythmia, this matter is still of concern. A more detailed electrophysiologic testing for a tailored ICD programming may be considered in more patients prior to ICD implantation.

[33]
EFFICACY OF SECONDARY PREVENTION BY CARDIAC RESYNCHRONISATION THERAPY WITH CARDIOVERTER-DEFIBRILLATOR FUNCTION

C. SCHUKRO, J. SIEBERMAIR, G. STIX, J. KASTNER, T. PEZAWAS, M. WOLZT, H. SCHMIDINGER

MEDICAL UNIVERSITY OF VIENNA, VIENNA, AUSTRIA

Background Sudden cardiac death survivors meeting the criteria for cardiac resynchronisation therapy (CRT) are at high risk for ventricular arrhythmias, and therefore benefit from implantable cardioverter/defibrillators (ICD). We aimed to evaluate the efficacy of CRT with ICD function (CRT-D) for secondary prevention of sudden cardiac death.

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Methods Between January 1999 and November 2006, overall 246 CRT systems were implanted in our institution, of which 74 included ICD function. In the CRT-D collective, 45 suffered from ischemic CHF (61%) and 29 from non-ischemic CHF (39%), and 27 patients (36%) had documented atrial fibrillation (12 permanent and 15 paroxysmal). Within the CRT-D group, 11 patients were sudden death survivors (15%).
Results Within a follow-up period of 2.0±1.7 years, 31/172 patients with singular CRT died (18%), whereas - within a follow-up period of 1.2±1.5 years - only one patient with CRT-D (9%) died after the first year from multiple organ failure. Ventricular arrhythmias were recorded for 7 patients (64%). Ventricular anti-tachycardic pacing was performed in 4 patients (36%). Appropriate defibrillation was recorded for 6 patients (55%), of which 5 (45%) also underwent inappropriate shocks (due to atrial fibrillation or T-wave oversensing).
Conclusions Sudden cardiac death survivors meeting the criteria for cardiac resynchronisation therapy do benefit from CRT with ICD function. Nevertheless, the problem of inappropriate defibrillator discharges is still of concern.

[34]
PREDICT VARIABLES OF PSYCHOPATHOLOGICAL DISORDERS AFTER A CARDIOVERTER DEFIBRILLATOR IMPLANTATION

J. SÁNCHEZ MUÑOZ[1], C. GODOY FERNÁNDEZ[2], E. FERNÁNDEZ ROS[2], A. GARCÍA ALBEROLA[1], M. LOZANO GARCÍA[2], J. MARTÍNEZ SÁNCHEZ[1], D. LORENZO LUNA[2], I. GIL ORTEGA[1], S. MORENO REVIRIEGO[1], M. OLIVA SANDOVAL[1], P. PEÑAFIEL VERDÚ[1], M. VALDES CHAVARRI[1]

[1]HOSPITAL UNIVERSITARIO VIRGEN ARRIXACA, MURCIA, SPAIN; [2]DEPARTAMENTO DE PERSONALIDAD, EVALUACIÓN Y TRATAMIENTOS PSICOLÓGICOS, FACULTAD DE PSICOLOGÍA, UNIVERSIDAD DE MURCIA, MURCIA, SPAIN

Background and Aims Emotional disorders which appear after the implantation of a cardioverter defibrillator (ICD) differ from one patient to the others. In this way, we have studied different variables which could predict the development of psychopathological symptoms in the process of adaptation to the device. The interest in detecting these emotional symptoms lies in the relation between a higher rate of ventricular arrhythmias and appropriated ICD shocks with anxiety and depression symptoms.
Methods We studied 53 patients, 45 males and 8 females aged 19 to 76, who had carried an ICD for a period of time between 1 to 5 years (80,8%). The presence of previous and posterior psychopathological disorders to the implantation of the ICD was evaluated by means of an opinion poll.
Results Previous to the implantation of the ICD, 26,4% of the patients had suffered from anxiety, 20,8% from depression and 5,7% from anxious-depression. After the implantation of the ICD, 29,8% showed symptoms related to anxiety, meanwhile 24,5% related to depression. A statistical relationship between the variable "previous anxiety" and the posterior development of it after the implantation was shown by means of Pearson's chi-square test (p=0,00 for Tau and p=0.01 for uncertainty). Similar results were obtained between the variable "previous depression" and the posterior development of depressive symptoms (p=0,00 for Tau and p=0.01 for uncertainty).
Conclusions The existence of symptoms of anxiety and depression previous to the implantation of an ICD predicts the posterior development of psychopathological disorders. This fact could let detect those patients in higher risk and offer preventive measures.

[35]
TEMPORAL ASSESSMENT OF THE VENTRICULAR PREMATURE BEATS TRIGGERING VENTRICULAR FIBRILLATION

J. SÁNCHEZ MUÑOZ, A. GARCÍA ALBEROLA, J. MARTÍNEZ SÁNCHEZ, I. GIL ORTEGA, M. OLIVA SANDOVAL, S. MORENO REVIRIEGO, P. PEÑAFIEL VERDÚ, M. VALDES CHAVARRI

HOSPITAL UNIVERSITARIO VIRGEN ARRIXACA, MURCIA, SPAIN

Recurrent episodes of ventricular fibrillation (VF) during arrhythmic storms may be triggered by ventricular premature beats (VPCs). It is not known whether isolated episodes or those occurring in the same patient after a long period of time have a similar behaviour. The aim of the study was to analyze the VPCs triggering spontaneous VF in patients with an ICD.
Method Spontaneous episodes of VF recorded by an implanted ICD in 250 consecutive patients were included in the study. The onset of each episode was analyzed using bipolar and far field available electrograms.
Results Thirty one episodes of spontaneous VF were detected in 12 patients (9 men, age 49±22 y) with the following diagnoses: Brugada syndrome (n=4), ischaemic heart disease (n=3), dilated cardiomyopathy (n=2), hypertrophic cardiomyopathy (n=1), short-coupled variant of torsades de pointe (n=1), endocardial fibroelastosis (n=1) and idiopathic VF (n=1). The arrhythmia leading to the ICD implant was VF in 7 patients. All the spontaneous VF episodes were initiatied by a VPC. The morphology and coupling interval of the extrasystole remained unchanged in patients with two or more episodes with a time lag between them ranging from several minutes up to 5 years. Additional PVCs during sinus rhythm were observed before the onset of the episode in 21 cases. The morphology, the coupling interval and the previous sinus RR interval were not significantly different when compared with the corresponding ones from the PVC triggering VF (409±121 vs 411±123 ms and 801±233 vs 793±230 ms respectively, n.s.).
Conclusion Spontaneous VF episodes are triggered by VPCs whose characteristics remain unchanged for an extended period of time. Those VPCs may also appear during the baseline rhythm without triggering the arrhythmia. These observations suggest a specific mechanism for the initiation of VF in many patients.

[36]
ICD REGISTRY LATIN AMERICA PRELIMINARY REPORT. PRIMARY VS SECONDARY PREVENTION OF SUDDEN DEATH: DEMOGRAPHICS AND FOLLOW UP

J. RAMOS[1], C. MURATORE[2], J. PACHÓN MATEOS[3], A. RODRÍGUEZ[4], A. GONZÁLEZ HERMOSILLO[5], R. ASENJO[6], D. RODRÍGUEZ[7], E. COSTA[8], J. ESCUDERO[9], W. REYES CAORSI[10], E. CUVILLIER[11], J. MALONEY[12]

[1]HOSPITAL ITALIANO, ROSARIO, ARGENTINA; [2]MEDTRONIC LATINOAMÉRICA, BUENOS AIRES, ARGENTINA; [3]HOSPITAL DEL CORAZÓN, SAN PABLO, BRAZILL; [4]VA MEDICAL CENTER, SAN JUAN, PUERTO RICO; [5]INSTITUTO NACIONAL DE CARDIOLOGÍA, MEXICO DF, MEXICO; [6]CLÍNICA ALEMANA, SANTIAGO, CHILE; [7]FUNDACIÓN SANTA FE, BOGOTÁ, COLOMBIA; [8]CARDIORITMO SAN JOSÉ DOS CAMPOS BRAZIL; [9]HOSPITAL CARLOS ARÉVALO, CARACAS, VENEZUELA; [10]CASA DE GALICIA, MONTEVIDEO, URUGUAY

Introduction The Medtronic ICD Registry was introduced in Latin American to collect data related to indications and follow-up in patients (pts) receiving an ICD for primary and secondary prevention of sudden death. We evaluated the characteristics and outcomes of pts treated for primary prevention in comparison with secondary prevention.
Methods Of the 300 pts included, 142 received an ICD for primary prevention (Group A) and 158 pts for secondary prevention (Group B). The indications for group A were based on the criteria of MADIT

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II (49%), SCDHeFT (37%), and others (14%). For Group B the inclusion criteria were ventricular tachyarrhythmias (VT/VF) (85.5%) or syncope with induced VT/VF (14.5%).
Results Pts in group A were older (62.2 vs 58.6 years, p=0.014), predominantly male (85.9% vs 70.9%; p=0.002), with a lower EF (25.7% vs 43.4%; p<0.0001) and increased LVEDD (60.2 vs 52.6 mm; p<0.0001). Most pts were treated with beta-blockers (82.4% vs 62%; p<0.0001) and diuretics (74.6% vs 46.8%; p<0.0001). In group B, the average NYHA class was worse (1.92 vs 2.22; p=0.0006) and amiodarone was used more often (67.1% vs 30.3%; p<0.0001).
In pts with EF <40%, age, gender, NYHA class and LVEDD were similar in both groups. The mean EF was worse in primary prevention (25.7% vs 30.1%; p<0.0001).
Mean follow-up was 10 months and 74.7% had a follow-up more than 6 months. Mortality and hospitalization were similar in both groups and rates of appropriate interventions were more frequent in Group B (21.5% vs 11.9%).
Conclusions This is the first report that shows clinical characteristics of primary prevention in Latin America. This preliminary report shows no differences in mortality and hospitalizations between the two groups with more appropriate interventions in secondary prevention with a short follow-up.

[37]
NONISCHEMIC CARDIOMYOPATHY. COMPARISON OF PATIENTS WITH A DEFIBRILLATOR TREATING CHAGAS CARDIOMYOPATHY AND IDIOPATHIC DILATED CARDIOMYOPATHY

E. COSTA[1], C. MURATORE[2], A. MALAN[3], C. TENTORI[4], L. BATISTA[5], P. UREÑA[6], R. CALDERON[6], R. TAKEDA[7], J. MALONEY[8]

[1]CARDIORITMO, SAO JOSE DOS CAMPOS, BRAZIL; [2]CMGSM, BUENOS AIRES, ARGENTINA; [3]RITMOVIDA, GOIANA, BRAZIL; [4]H FERNANDEZ, BUENOS AIRES, ARGENTINA; [5]C M MEDVITTA, GOIANA, BRAZIL; [6]CEDIMAT, SANTO DOMINGO, DOMINICAN REPUBLIC; [7]CCPRC, SAN JUAN, PUERTO RICO; [8]MEDTRONIC, SAN PABLO, BRAZIL; [9]MEDTRONIC, MINNEAPOLIS, USA

Nonischemic dilated cardiomyopathy frequently causes sudden cardiac death. Information on the use of ICD's in this patient population is scarce.
Purpose To compare the clinical characteristics at implant and at follow-up in patients with Chagas disease and with idiopathic dilated cardiomyopathy in the ICD Registry Latin America.
Methods Of the 846 patients included in the ICD Registry Latin America, we analyzed the data from 82 Chagas disease patients: mean age 59±10 years, 71% male, EF 40±12%, LVDD 59±10 mm, 63% NYHA Functional Class I/II, 47% with Right Bundle Branch Block (RBBB), follow-up averaged 9.6 months (1-32); and 102 patients with idiopathic dilated cardiomyopathy mean age 59±13 years, 78.5% male, EF 28±11%, LVDD 66±12 mm, 58% NYHA Functional Class I/II, 6.8 with RBBB, follow- up averaged 6.9 months (1-25).
Results The patients with idiopathic dilated cardiomyopathy are much more likely to be indicated for primary prevention (45% vs 9.7% p<0.0001), have higher LVDD (66±12 mm vs 59±10 mm, p<0.02), lower EF (28% vs 40%, p<0.01) and are more likely to have biventricular pacing (45.1% vs 13.4%, p<0.0001). The Chagas patients have a higher frequency of RBBB (47% vs 6.8%, p<0.0001). During the follow-up, the Chagas patients have more appropriate therapies (47% vs 25%, p<0.02). There were no statistically significant differences regarding hospitalization or mortality in the two patient populations.
Conclusions The lower number of indications for primary prevention and biventricular pacing in Chagas patients is likely due to socioeconomic reasons as well as the higher prevalency of RBBB in these patients. During the short follow-up period, the Chagas patients presented more appropriate therapies likely due to the higher number of secondary prevention of sudden cardiac death patients and because Chagas disease is associated with a higher arrhythmia substrate.

[38]
ISODIAMETRIC ICD LEAD WITH BACKFILLED COILS AND INCREASED TENSILE STRENGTH CAN BE EXTRACTED WITHOUT SHEATH ASSISTANCE

D. GOLDMAN[1], J. FLINK[2], J. VOEBEL[2], M. MARSHALL[2]

[1]JERSEY SHORE UNIVERSITY, MEDICAL CENTER, NEPTUNE, NJ, USA; [2]MEDTRONIC INC., MINNEAPOLIS, MN, USA

ICD leads, particularly with dual coils, are more difficult to extract than standard bradycardia pacing leads. With recent data suggesting shorter functionality of ICD leads, the need for extraction is likely to increase. Mechanisms making extractions more difficult include lack of isodiametric design, decreased tensile strength causing lead fragmentation during extraction, and more importantly, tissue ingrowth of the coils. Tissue ingrowth has been described as early as 6 months after implant in animal models. Medtronic developed Sprint Fidelis model 6949 ICD lead; 6.6 french, isodiametric design, dual defibrillation coils imbedded in silicone rubber adhesive preventing tissue encapsulation and bonding coils to the lead body. Unique to this lead, a cable conductor configuration (versus traditional coaxial design), Tensi-Lock™ increasing the leads tensile strength during attempted extractions.
Methods Four patients underwent attempted extraction of 6949 ICD leads with only manual traction using standard stylets under fluoroscopic guidance. No other extraction devices were utilized. The leads had been implanted for $5^1/_2$, 6, 24, 30 months. All extracted leads were returned to the manufacturer for analysis and evaluation of tissue ingrowth.
Results Three leads were extracted without evidence of hemodynamic compromise. An attempt was made to remove the fourth lead implanted for 30 months but could not be completely extracted due to the inability to retract the screw mechanism secondary to conductor coil fracture. However under fluoroscopic guidance both proximal and distal coils of this lead were freely movable. Gross examination of the removed leads revealed no evidence of lead disruption or tissue ingrowth. High magnification photography also showed no evidence of significant tissue ingrowth.
Conclusions 1) Extraction of a unique isodiametric dual coil ICD lead is possible at least up to 24 months following implant with only a standard stylet. 2) The leads extracted showed no evidence of significant tissue ingrowth.

[39]
WHEN TO IMPLANT AN ICD IN BRUGADA SYNDROME?

R. DOURADO, J. ABECASIS, P. ADRAGÃO, D. CAVACO, A. FERREIRA, V. CARMELO, R. CANDEIAS, K. REIS, F. MORGADO, A. SILVA

HOSPITAL DE SANTA CRUZ, LISBON, PORTUGAL

The Brugada Syndrome (BS) is reported as having high risk of sudden arrhythmic death (SCD). The implantable cardioverter-defibrillator (ICD) remains the only effective option to prevent SCD.
Objective To evaluate if the benefit for ICD implantation is the same in all the members of this population.
Methods Retrospective analysis of 21 patients (Pts) diagnosed with BS from 1999 to 2007 [16 males (76%); 42.19±13.22 years old]. Type I ECG was present either spontaneously (14 Pts) or after pharmacological testing (7 Pts), in presence of clinical criteria.
Results 4 Pts had been resuscitated from SCD; 4 Pts had VT, 7 Pts had syncope and 12 Pts were asymptomatic (2 Pts had a family his-

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tory of BS, 4 Pts had a family history of SCD and 3 Pts were investigated because of ECG type I). EPS was performed in 14 Pts: 4 asymptomatic Pts with type I ECG, 6 Pts with a history of syncope or sustained VT, 5 asymptomatic Pts with type I ECG after pharmacologic testing. A sustained ventricular arrhythmia was induced in 10 Pts. All Pts were implanted with single-chamber ICD. Through a 99 month follow-up period, 4 Pts received 13 appropriate shocks (2 Pts resuscitated from SCD, 2 Pts with syncope and EPS inducibility) and 2 Pts were adequately treated with antytachycardia pacing (1 Pt resuscitated from SCD, 1 Pt previous syncope). There were no appropriate shocks in the asymptomatic group. These patients received a total of 14 shocks (5 Pts) for supraventricular tachycardia (2/3 of inadequate therapy registries).
Conclusions Only Pts with previous syncope or SCD received appropriate shocks during 5 years. Inappropriate therapies were frequent. Symptomatic patients probably benefit more from ICD implantation. This should be taken into account in the ICD implant decision algorithm.

[40]
LONG-TERM EVOLUTION IN PATIENTS WITH DILATED CARDIOMIOPATHY CARRIERS OF IMPLANTABLE DEFIBRILLATOR

M. MOGOLLON, A. PEDROTE, E. ARANA, N. ROMERO, L. GARCIA-RIESCO, J. FERNANDEZ, M. GARCIA LIZANA, M. FRUTOS, R. PEREZ DE LA YGLESIA, F. ERRAZQUIN

[1] HOSPITAL VIRGEN DEL ROCIO, SEVILLA, SPAIN

Introduction prognosis of patients with idiopathic dilated cardiomiopathy (IDM) with an implantable cardioverter defibrillator (ICD) does differ from those with isquemic etiology.
Objectives to know long-term evolution, malignant ventricular arrhythmias predictors and prognostic value of programmed electrical stimulation (PES) in patients with IDMI and an ICD.
Methods and Materials From 1992 to 2006 a total of 43 patients received an ICD for secondary prevention (83,7% males, 60.3±13 years old). All patients presented an ejection fraction (EF) lower than 40% (27,9±8%). Reasons for ICD implantation were: aborted sudden death or syncopal ventricular tachycardia in 52,6% of patients, non syncopal malignant ventricular arrhythmia (MVA) induced in programmed electrical stimulation in 34,2%, and not clarified syncope in 13,2%. PES was carried out in most patients (95,3%), 58,5% of whom a MVA was induced.
Results With a 34-month monitoring median, there were 8 deaths (18.6%), 2 due to sudden death, 1 cardiogenic shock, and 5 due to non-cardiology causes. Appropriate shocks were recorded in 30 patients (69,8%) with a 4-month median up to first shock (1-12,75 IQR). Age, NYHA functional class, EF, intraventricular conduction delays, ICD indications and PES results were analysed as shock predictors, proving that only patients with heart failure (II-III NYHA functional class) presented a significant increase in appropriate shocks (p=0.038), and a tendency to significance in those with MVA induced by PES (p=0.075). PES presented 67% of sensibility and 61% of specifity to predict later events, with 79% of positive predictive value and 47% negative predictive value.
Conclusions With a long term follow-up, two thirds of patients with IDM and ICD for secondary prevention present appropriate shocks. Functional class and ventricular arrhythmia induction in PES help to predict the appearance of later malignant arrhythmias.

[41]
DDD PACEMAKER IMPLANTATION IN PATIENT WITH COMPLETE ATRIOVENTRICULAR BLOCK(CAVB) AND CONGENITALLY CORRECTED TRANSLOCATION OF THE GREAT ARTERIES(TGA): CASE REPORT

N. YOON, J. CHO, H. PARK, H. YOON, J. MOON, K. KIM, Y. HONG, J. KIM, Y. AHN, M. JEONG, J. PARK, J. KANG

CHONNAM NATIONAL UNIVERSITY HOSPITAL, GWANGJU, SOUTH KOREA

A 56 year-old man admitted suffering from dizziness and chest tightness for 3 days. He was 30 pack years current smoker. His blood pressure was 140/90 mm Hg, heart rate was 35 bpm. ECG showed complete AV block with 35 beats of ventricular beat. Sinus rate was 54 bpm. Mild cardiomegaly was seen in chest X-ray. Temporary pacemaker was tried via transfemoral approach at first. However, electrode catheter was not introduced in RV despite several trial. We found that he had no IVC which drained into RA. Venous drainage into SVC from dilated azygos vein was identified after venogram (Figure A). Thus, electrode was positioned in right side ventricle via azygos vein and SVC. Echocardiogram revealed that the position of the two ventricles was reversed so that the RA connects to the LV; and the LA connects to the RV, also the aorta arises from the RV and sends blood around the body; and the pulmonary artery arises from the LV and takes blood to the lungs(Figure B). Chest CTA revealed A-V and V-arterial discordance with morphologically LV in right side and morphologically RV in left side and interrupted IVC with azygous continuation(Figure C). Abdomen CT angiogram revealed situs ambiguous with polysplenia. Anyway, he needed permanent pacemaker definitely. Thus, DDD pacemaker was implanted via left axillary vein(Figure D). The pacemaker parameter showed ordinary feature. We have followed up him without any problem. In the point of pathomechanism of CAVB, because the ventricles are reversed, the conducting pathways in the heart are thin and fragile and may not conduct the electrical impulses around the heart normally. Thus, there is an increased chance of interruption of the electrical impulses before they reach the bottom chambers. This is the first experience of pacemaker in congenitally corrected TGA.

[42]
A CARDIOPULMONARY ASSESSMENT OF THE CLOSED LOOP SYSTEM IN ABLATE AND PACE PATIENTS

R. VEASEY, P. HONG, J. SILBERBAUER, A. SAGAR, N. MADDEKAR, W. TAGGU, V. PARANAHEWA, N. PATEL, G. LLOYD, N. SULKE

EAST SUSSEX HOSPITALS NHS TRUST, EASTBOURNE, UNITED KINGDOM

Purpose The Closed Loop System (CLS) is a pacemaker sensor which relies on changes in intra-ventricular impedance to control heart rate. The aim was to assess 'ablate and pace' patients' cardiopulmonary performance using CLS and accelerometer (ACC) based rate-responsive pacing modes.
Methods Ablate and pace' pts were randomised to right ventricular high-septal or apical pacing. A familiarisation treadmill and sensor optimisations were initially performed. Subjects undertook head-to-head cardiopulmonary treadmill tests comparing ACC and CLS rate-responsive pacing modes. Six mins of light exercise (workload at 50% of VO2Peak from optimisation treadmill) followed immediately by a symptom limited ramp test using the Chronotropic Assessment Exercise Protocol was used for cardiopulmonary evaluation of light and heavy exercise performance.
Results 15 patients (13 male; age 72.1±8.8 yrs) were studied. ACC mode required optimisation in 7 subjects, none with CLS. VO2 response time to steady state during light exercise was 158.4±28.3 s in CLS vs 145.7±43.4 s in ACC, p=ns. Peak VO2 during heavy exercise was 1.6±0.5 l/min in CLS vs 1.5±0.5 l/min in ACC, p=ns. Total

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exercise time was 665±207 seconds in CLS vs 660±189 s in ACC, p=ns. Workloads were 6.5±3.6 METS in CLS vs 6.3±3.3 METS in ACC; p=ns. Lead placement did not affect cardiopulmonary performance (p=ns). Heart rates were not significantly different during light exertion, peak exertion and in recovery.
Conclusion CLS functioned optimally with septal and apical RV lead placement and required less optimisation programming than ACC. There was no significant difference in cardiopulmonary performance during light and heavy exercise in 'ablate and pace' patients using either CLS or ACC rate-responsive pacing modes.

[43]
WHAT IS THE INFLUENCE OF HIGHER RIGHT VENTRICULAR STIMULATION ENERGY ON QRS COMPLEX DURATION?

V. VANCURA, D. WICHTERLE, K. LEFFLEROVA, J. BYTESNIK, J. KAUTZNER

DEPARTMENT OF CARDIOLOGY, IKEM, PRAHA, CZECH REPUBLIC

Purpose Limited evidence is available about the relation between left ventricular stimulation energy and QRS complex duration. The influence of the right ventricular stimulation energy on QRS complex duration hasn't been studied in detail yet. This study was aimed at the revelation of such influence in patients having a pacemaker for AV conduction disturbances.
Materials and Methods The measurements were performed in 14 patients with AV block and either pacemaker dependency or slow spontaneous ventricular rate preventing fusion beats. All measurements were performed at the stimulation frequency of 100 bpm. Both standard surface ECG and vectocardiographic leads were digitized at a sampling frequency of 3906 Hz and band-pass filter settings of 0.05-1000 Hz for vectocardiography. Filtered and signal-averaged QRS vectors obtained from 12-20 stimulation cycles were used for further analysis. The change of the end of the depolarization was automatically detected by the cross-correlation analysis applied at the terminal portion of the QRS vector. The QRS complex duration during pacing at the threshold value and the stimulation energy of 4 V was compared by 2-tailed t-test.
Results All but two patients were males aged 67.3±10.4 years, 3.9±3.8 years after the ventricular lead implantation with current threshold values below 1.5 V/0.4 ms. Mean ejection fraction of the left ventricle was 45±14%. 7 patients had their electrode implanted into the right ventricular apex, 7 in the septal position. The QRS complex was shorter by 4.2±2.2 ms with higher stimulation energy when compared to the threshold energy ($p<0.001$). The results show some variation in the degree of shortening but we had no patient without QRS complex shortening at higher stimulation energy.
Conclusions Higher right ventricular stimulation energy is associated with shorter QRS complex duration. This finding might have practical implication for cardiac resynchronization therapy.

[44]
MINIMAL INVASIVE ELECTRODE REPOSITION WITH ABLATION CATHETER: A NEW TECHNIQUE FOR THE TREATMENT OF PASSIVE FIXATION ATRIAL LEAD DISLOCATION

L. GELLER, S. SZILAGYI, E. ZIMA, A. ROKA, G. SZUCS, V. KUTYIFA, B. MERKELY

CARDIOVASCULAR CENTER, SEMMLEWEIS UNIVERSITY, BUDAPEST, HUNGARY

Depending on the type of the electrode, dislocation occurs in 0.5-10% of pacemaker patients. We applied a new, minimal invasive reposition procedure with an ablation catheter for the treatment of passive fixation atrial (PFA) lead dislocation.
Dislocation of the passive fixation atrial lead was observed in six of 428 patients (4 female, 2 male, age 70±6 years) 3.2±3.9 months after the implantation. Ablation catheter was introduced into the right atrium through the femoral vein, and positioned above the curve of the dislocated PFA lead with bended tip. By pulling back the ablation catheter, the tip of the PFA lead could be released. The lead assumed its preformed "J" curve, and this itself or further movement of the catheter could help to reach the desired lead position.
After lead repositioning, suitable pacing and sensing parameters were registered. The atrial signal was 2.4±1.6 mV, the pacing threshold was 1.6±1.1 V; 0.5 ms. During follow-up (7.6±1.9 months) moderate increase of the pacing threshold was found in one patient (3 vs. 4 V), no changes were measured in the other 5 cases.
Electrode reposition with a catheter is a safe procedure, it means smaller burden for the patient compared to the established reposition operation. The technique can be used successfully for the treatment of dislocation of passive fixation atrial leads.

[45]
ANALYSIS OF CURRENT DENSITY DISTRIBUTION NEAR THE RING AND DIAGONALLY ARRANGED HALF-RING ELECTRODES IN BIPOLAR AND OLBI STIMULATION USING THE FINITE ELEMENT METHOD

S. SUZUKI[1], Y. CHO[1], S. INOUE[1], T. MATSUBARA[1], M. SHIBATA[1], Y. KURITA[1], T. NAGAI[1], D. FUJIBAYASHI[1], R. YANAGISAWA[1], K. HASHIZUME[2], N. ISHIKAWA[3], Y. AOKI[3]

[1]HIRATSUKA CITY HOSPITAL, HIRATSUKA, JAPAN; [2]UTSUNOMIYA SAISEKAI HOSPITAL, UTSUNOMIYA, JAPAN; [3]NIHON KOHDEN CORPORATION, TOKYO, JAPAN

Purpose We reported on the clinical study of right atrial pacing threshold in the OLBI (Overlapping biphasic) stimulation method with a VDD pacemaker. This time we made a three dimensional analysis model with computer simulation and verified our study.
Method Analysis model 1was composed of three parts of a human body, a heart and a pacemaker. Analysis model 2 was a block with dimensions of 20 by 20 by 20 mm cut out from Analysis model 1 for the detailed study of current density distribution near the electrodes. The current density of the analysis model was analyzed in two stimulation methods (bipolar and OLBI) and two types of pacing electrodes (ring and diagonally arranged half-ring electrodes). Laplace's equation was solved using the finite element method and the current density J was calculated.
Results (1) For Analysis model 1, the distal and proximal voltage was -10 V, 0V in the bipolar stimulation and -5 V, +5 V in the OLBI stimulation, using the same ring electrodes. Analysis model 1 showed that the OLBI produced more concentrated current density distribution than that of the bipolar. (2) According to Analysis model 2, The place in the atrial myocardium where the current density was 60 $\mu A/mm^2$ was within 2 mm from the surface for the diagonally arranged half-ring and within 1 mm from the surface for the ring, respectively, under the OLBI. Analysis model 2 also showed different manners of current flow via the ring and diagonally arranged half-ring electrodes in the OLBI.
Conclusions The 3D analysis model is useful for studying current density distribution in the case of using various kinds of stimulation methods and pacing electrodes. Our study suggests that the OLBI stimulation using the diagonally arranged half-ring electrodes could produce the most concentrated current density distribution among the three modalities.

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[46]
ELECTRONIC CLINICAL TRIAL MANAGEMENT IN A WEB 2.0 WORLD

E. BISCHOFF, G. BARDY, G. JOHNSON, J. ANDERSON, C. MUNKERS, A. BROWN

SEATTLE INSTITUTE FOR CARDIAC RESEARCH, SEATTLE, USA

Background Physicians and nurses are constantly bombarded with technological challenges in Electronic Clinical Trial (ECT) Management. Acronyms like AJAX, XACML, RSS and WSDL hint at the underlying complexity of modern systems. Web2.0 however, is not just another acronym. It is a collection of tools that provide an opportunity for clinicians to regain control. Web2.0 will enhance the online presence of the ECT Portal, making it simpler, quicker, more efficient and flexible than the older, linear, click and submit web pages. The purpose of this paper is to demonstrate the value of this new ECT tool.
Methods The challenge in ECT Management is to design a secure, database driven online presence that can be utilized from every aspect of the ECT. Establishing a simple, consistent Web2.0 site (using PHP, Javascript and XML elements) allows access by patients, industry sponsors, study coordinating centers and site administrators. Each has individualized information, navigation, reporting and data entry tools available within their security level. Using online feeds providing current disease-related news and information, using messaging and blogging tools to encourage collaboration and creating a user-friendly consistent interface, the ECT Management Portal is designed to keep participants returning to the site and staying informed and involved.
Results Navigation through the portal was dramatically faster, cutting seconds off wait times after each of dozens or hundreds of mouse clicks. The internet bandwidth needed was <50% normal site usage, because the entire portal was basically one simple web page, changes only occurring in small sections of the screen and only as needed. The simplified, consistent interface made navigation easier for all.
Conclusion The utilization of Web 2.0 processes for ECT Management dramatically improved patient communication and cooperation, simplified data submission and reporting for researchers, allowed industry collaboration and opened up new research opportunities and information sharing.

[47]
PRETREATMENT WITH VERAPAMIL AND IRBESARTAN INCREASES THE EFFICACY OF DIRECT-CURRENT CARDIOVERSION IN RESTORATION OF SINUS RHYTHM IN PATIENTS WITH ATRIAL FIBRILLATION

G. DE MASI DE LUCA[1], A. GALATI[1], M. ACCOGLI[1], P. PALMA[1], R. ALEMANNI[2], A. TALERICO[2], F. BORRELLO[2], S. IACOPINO[2]

[1]DIPARTIMENTO CARDIOVASCOLARE, OSPEDALE CARD. PANICO-TRICASE, TRICASE (LECCE), ITALY; [2]ELETTROFISIOLOGIA E CARDIOSTIMOLAZIONE, SANT' ANNA HOSPITAL, CATANZARO, ITALY

Background To evaluate prospectively the effects of pretreatment with verapamil and irbesartan, on the success of restoration of sinus rhythm before the direct current cardioversion(CVE) for Atrial Fibrillation(AF). The purpose of this study is to evaluate the role of no-antiarithmic drugs which can modify the substrate where AF develop and keep, interfering on electrical and structural remodeling, on supporting CVE
Methods 70 consecutive patients with AF(mean duration 6,4±3,2 months) with indications for cardioversion were assigned randomly to two groups, one treated with verapamil and irbesartan (verapamil/irbesartan group) and the other with amiodarone (amiodarone group). The groups did not differ concerning age (78±12 vs 74±12, respectively), LA diameter (45±7 vs 43±9), and ejection fraction (48±12 vs 45±17). After randomly assigned pretreatment with verapamil (240 mg for three days before CVE) and irbesartan (terapeutic target 300 mg one month before CVE) or amiodarone (200 mg for four weeks) DC cardioversion was performed. If sinus rhythm was restored, the treatment was continued for one month. The success of CVE and the rate of AF recurrence in the follow-up period were evaluated in the verapamil/irbesartan group in comparison with amiodarone group by statistical analysis of non-inferiority.
Results DC cardioversion restored sinus rhythm in 34/37 patients (92%) in the amiodarone group and in 30/33 patients (91%) in the verapamil/irbesartan group (p=0,0001). After one week follow-up 97% (33/34) of amiodarone pretreated patients (CVE was successful) versus 77% (23/30) of verapamil/irbesartan pretreated patients (CVE was successful) was remained in sinus rhytm (p=n.s.); after one month follow-up 91% (31/34) of amiodarone pretreated patients versus 70% (21/30) of verapamil/irbesartan pretreated patients was remained in sinus rhythm (p=n.s.). The pretreatment in two groups was equally tolerated.
Conclusion Pretreatment with verapamil/irbesartan may improve acute success of CVE but it isn't effective on maintenance of sinus rhythm after DC cardioversion in patients with AF.

[48]
BILIOPANCREATIC DIVERSION REDUCES QT INTERVAL AND DISPERSION IN MORBIDLY OBESE PATIENTS

A. SCOPINARO[1], F. PAPADIA[2], D. ROLLANDO[1], G. BEZANTE[1], G. BERTERO[1], G. ADAMI[2], N. SCOPINARO[2], A. BARSOTTI[1]

[1]DIMI-UNIVERSITÀ DI GENOVA, GENOVA, ITALY; [2] DICMI-UNIVERSITÀ DI GENOVA, GENOVA, ITALY

Objectives To evaluate QTc and QTdispersion (QTd) in morbidly obese patients (MOB) individuals and to determine the effects of biliopancratic diversion (BPD) and the weight-loss after BPD on ventricular repolarization parameters.
Background MOB has a 50% -100% increased risk of death associated with a 1.6-fold increased risk of sudden death. BPD surgery induces rapid and considerable weight loss through severe lipid maladsorption, thus achieving long-term weight control.
Methods 85 MOB patients (age 42±12 yrs, 66 females, mean BW 120±29 kg, BMI 45±11 kg/m2), out of 330 MOB subjects who had a Bariatric Surgical consultation between January 2001, and July 2002, were enrolled. Inclusion criteria: sinus rhythm, unremarkable 12 leads surface ECG, no A-V blocks and/or bundle branch blocks, normal serum electrolyte profile and no medical therapies exerting known effects on QT interval. Exclusion criteria were: previous diagnosis of coronary artery disease, known cardiovascular disease, atrial fibrillation or any other known cardiac arrhythmias, cancer or renal dysfunction.
Results 86% of patients had QTc >440 msec and/or QTd >60 msec. MOB individuals showed a mean QTc maximum of 446±28 msec and a mean QTd of 52±20 msec. A close correlation was found between QTc and QTd (p<0,0001); R2: (0,33). One-month after-BPD, before any weight loss, mean QTc was 420 msec and remained stable at follow-up; QTd was 32 msec at one- and six-month and became 35 msec at one-year.
Conclusions Ventricular repolarization abnormalities are significantly increased in MOB individuals. Reduction of QT-abnormalities after-BPD is independent from weight loss and is caused by the 100% reduction of glucose plasma soon after surgery. This effect may be related with surgical interruption of the entero-insular axis.

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[49]
ASSESSMENT OF THE VARIATIONS IN NEUROHORMONAL PROFILE, HAEMODYNAMIC AND FUNCTIONAL CAPACITY IN HEART FAILURE PATIENTS TREATED WITH CARDIAC RESYNCHRONIZATION

E. MENARDI, A. VADO, G. ROSSETTI, E. RACCA, M. FEOLA, G. ROSSO, L. MORENA, E. PEANO

DIPARTIMENTO DI CARDIOLOGIA, AZIENDA OSPEDALIERA S.CROCE E CARLE, CUNEO, ITALY

Background Cardiac Resynchronization Therapy (CRT) has been shown to improve the clinical status and survival in congestive heart failure (CHF) patients, but little is known about its influence on neurohormonal status.
Methods and Results We studied the changes of the functional state, echocardiografic data, cardiopulmonary testing and neurohormonal situation in patients treated with CRT for moderate to severe heart failure. This study comprised 120 NYHA II to IV patients, all indicated to CRT; one hundred consented to be implanted (gr.A), whereas 20 refused (gr.B). All patients were studied with Echocardiography (Echo), Cardiopulmonary test (CPX), and repeated evaluation of Brain Natriuretic Peptide (BNP), Endotelin (END), big Endotelin (big-END), epinephrine (EPI), alfa tumor Necrosis Factor (alfa TNF) before and 1 year after CRT implant. In gr.A all clinical, Echo, CPX parameters significantly improved between baseline and follow-up whereas only BNP and big-END changed significantly. On the contrary, none of these parameters significantly changed in gr.B.
Conclusions This study showed an echocardiographic , cardiopulmonary and neurohormonal profile improvement in a consistent heart failure population treated with CRT on top of optimal medical therapy.

[50]
THE MEANING OF GENE ANALYSIS IN JAPANESE PATIENTS WITH BRUGADA SYNDROME

D. MIURA[1], K. NAKAMURA[1], M. OUCHIDA[2], I. OHMORI[3], K. KUSANO[1], K. SHIMIZU[2], T. OHE[1]

[1]DEPARTMENT OF CARDIOVASCULAR MEDICINE, OKAYAMA UNIVERSITY, OKAYAMA, JAPAN; [2]DEPARTMENT OF MOLECULAR GENETICS, OKAYAMA UNIVERSITY, OKAYAMA, JAPAN; [3]DEPARTMENT OF PHYSIOLOGY, OKAYAMA UNIVERSITY, OKAYAMA, JAPAN

Background Brugada Syndrome (BS) is an inherited arrhythmogenic disease characterized by ST segment elevation, and an increased risk of sudden cardiac death as the result of ventricular fibrillation (VF). SCN5A gene encodes a cardiac voltage-dependent sodium channel, and its mutation was found in BS patients. However, the relationship between SCN5A mutation and VF is still unclear.
Methods and Results Genomic SCN5A were analyzed by PCR and direct sequencing in 86 Japanese patients with BS. We detected SCN5A mutations in 16.1% of BS. VF was detected in 27.3% of the mutation carrier patients and 15.8% of the non-mutation carrier patients. The family history was detected in 27.3% of the mutation carrier patients and 24.6% of the non-mutation carrier patients.
Conclusion BS patients with SCN5A mutation have tendency to have the higher incidence of VF. Thus, it is worthwhile to examine the mutation in BS patients, particularly family members of BS patients with VF. As 24.6% of BS patients with non-mutation have family history of BS, some other gene mutation beside SCN5A are expected to be found in near future.

[51]
USEFUL MAPPING SYSTEM CARTO MERGE IN ATYPICAL ATRIAL FLUTTER FOLLOWING ATRIAL FIBRILLATION ABLATION: CASE REPORT

R. LUISE, A. TACCARDI, G. MUOIO, L. MANTINI, G. D'ORAZIO

DIPARTIMENTO DI CARDIOLOGIA, UTIC-ELETTROFISIOLOGIA, CLINICA VILLA PINI ABRUZZO, CHIETI, ITALY

Introduction Electroanatomical mapping for radiofrequency (RF) ablation of tachycardias has become an important role, and sometimes it is needful. The CARTO MERGE system reached a very important position guiding the lead localization in the cardiac chamber.
Results Our report refers about a 65 years old man affected by a persistent, refractory to drugs therapy, atrial fibrillation (AF) treated with transcatheter RF ablation with CARTO mapping. The left atrium (LA) CARTO mapping underlined a diffused basal reduction of atrial myopotentials (MYP). The procedure was conducted with circumferential RF lesions of pulmonary veins, LA root, mitral and cavotricuspid istmus. The follow up with 24-hours-Holter every month during amiodarone treatment underlined no AF recurrences. After eleven month an atypical persistent LA flutter was present. A new ablation procedure was undergone with previous cardiac angioCT for LA images acquisition. The LA mapping highlights recordable MYP only around the auricular ostium and the absence of MYP in the whole chamber. The MERGE system was applied by means auricular MYP. The applications of RF in the ridge between the auricular ostium and the left veins antrum interrupted the atrial flutter. The programmed atrial pacing even with rapid overdriving burst did not induce atrial arrhythmias.
Conclusion In this case we can observe the utility of anatomical mapping to localize the LA and his structure even when it is no possible to acquire the electrical map in order to realize with few RF application the interruption of an atypical atrial flutter.

[52]
FOLLOW-UP OF PATIENTS AFTER CATHETER ABLATION FOR ATRIAL FIBRILLATION: EXPERIENCE IN OUR INSTITUTION

I. NEMCOVA, H. MLCOCHOVA, R. CIHAK, D. WICHTERLE, J. KAUTZNER

INSTITUTE FOR CLINICAL AND EXPERIMENTAL MEDICINE, PRAGUE, CZECH REPUBLIC

Introduction Radiofrequency catheter ablation has become an effective therapeutic option for patients (pts) with symptomatic and drug-resistant atrial fibrillation (AF). The reliable evaluation of success rate of the procedure is dependent of precise follow-up of all patients. The aim of this work is to describe the way of follow-up in our hospital.
Methods In our institution, selective catheter ablation for AF has been performed since 2000. At present, pulmonary vein antrum isolation (PVAI) using cool-tip ablation catheter, mapping Lasso catheter, navigation by intracardiac ultrasound (Acuson, Mountain View, USA) and 3D mapping system as CARTO merge (Biosense-Webster Inc.) or NavX (Endocardial Solutions, Inc.), are performed. Patients scheduled for PVAI are admitted one day before the procedure. All of them undergo CT angiography and in cases of persistant or chronic AF we perform also transesophageal echocardiography to exclude potential thrombi. After the discharge from the hospital, all patients are followed-up in our out-patient cardiology department (6 weeks, 3, 6, 9 and 12 month after PVAI), including 24-hour Holter ECG monitoring. During 3 months and 12 months visit we also perform 7-day Holter ECG monitoring to detect possible asymptomatic episodes of atrial fibrillation. Patients with left ventricular dysfunction before PVAI also undergo repeated echocardiography. In case of no recurrence of

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AF after 12 months, patients are scheduled for visits only once a year. In our hospital, we have a database of all patients after PVAI and results of each follow-up is there documented.
Conclusion Accurate follow-up is necessary to obtain reliable information about the success rate of all patients who underwent catheter ablation for AF. In our institution due to this schedule we obtain exact data about the efficacy of the PVAI.

[53]
TRIPLE-SITE VENTRICULAR PACING IN PERMANENT ATRIAL FIBRILLATION AND CONGESTIVE HEART FAILURE: A CASE REPORT

F. COLTORTI[1], P. SCARNERA[1], D. TARTAGLIONE[1], V. PALMIERI[1], M. CIREDDU[2], L. AURICCHIO[3], C. CIARDIELLO[3], A. CELENTANO[1]

[1]U.O.C. DI CARDIOLOGIA, OSPEDALE DEI PELLEGRINI, ASL NA1, NAPOLI, ITALY; [2]CENTRO CARDIOLOGICO MONZINO, MILANO, ITALY; [3]BOSTON SCIENTIFIC, MILANO, ITALY

Background Multisite stimulation of both ventricles has been reported to increase the efficacy of cardiac resynchronization therapy (CRT). AIM: To assess the feasibility of triple ventricular pacing (TVP) using two leads in the right ventricle (RV) in a candidate to CRT.
Methods A 62 year-old man with dilated cardiomyopathy, permanent Afib and CHF in NYHA Class III underwent Biv ICD implant. Left ventricular (LV) ejection fraction was 20% and the QRS width was 144 ms. The posterior LV was the most delayed portion. RV and interventricular electrical delays were measured: 20 ms between the RV outflow tract (RVOT) and the RV apex (RVA) and 100 ms between the RVOT and the posterior LV. Leads were positioned as follows: an active fixation defibrillation/pacing at the high septal RVOT, a tined pacing at the RVA and an LV pacing in a posterior branch of the coronary sinus. The RVOT lead was connected to the atrial port of the device while the others were connected in a standard fashion. The device was programmed in the DDD mode with the AV interval set to the shortest (10 ms) value, and all the atrial tachyarrythmias discrimination algorithms were deactivated.
Results TVP resulted in a greater QRS narrowing (80 ms vs 120 ms) and in a better acute hemodynamic effect, as compared to Biv pacing. In the short term, repeat telemetry and ambulatory ECG monitoring failed to reveal arrhythmias misclassification or inappropriate device inhibition/triggering.
Conclusions This case report shows the feasibility and safety in the short term of TVP in AFib pts candidate to CRT using currently available devices. The advantage of TVP over Biv pacing may be due to a reduction of longitudinal dyssynchrony and a greater effect in counterbalancing the delay at the inferior wall, that mimicks the electromechanical changes obtained with anodal pacing.

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[01]
COMPARISON OF COST EFFECTIVNESS OF ATRIAL FIBRILLATION TREATMENT ACCORDING TO PLACEMENT OF VENTRICULAR LEAD

A. DRZEWIECKA[1], R. MLYNARSKI[1], W. KARGUL[1], E. DRZEWIECKA[2]

[1]ELECTROCARDIOLOGY DEPARTMENT, MEDICAL UNIVERSITY OF SILESIA, KATOWICE, POLAND; [2]MEDICAL UNIVERSITY OF SILESIA, SOSNOWIEC, POLAND

Atrial fibrillation (AF) presents huge economic problems. Permanent ventricular pacing (VVI or DDD) compared to atrial pacing (AAI) can provoke AF, nevertheless in a certain group of patients with sinus node dysfunction (SND), ventricular pacing is highly recommended. There are many controversies concerning optimal localization of the lead in the right ventricle, as well as the influence of the ventricular lead localization on the frequency of AF episodes.

Purpose To find out how pacemaker lead localization in RV influences the number of AF episodes and how it affects the costs to the health care system.

Methods 64 patients (age 69.7±12.3) with SND and EF >50% were divided into 2 groups depending on localization of ventricular lead: G1 – in right ventricular outflow tract and G2 – apex. In all, DDDR pacemakers with active fixation leads were implanted. Localization was confirmed by fluoroscopy and ECG. During 2 or more follow-up visits (2, 6 and every 6-months after implantation; max. 30 months) ECG, clinical and pacemaker data with intracardiac Holter were analyzed. Cost calculations were made from the point of view of a national health service – prices in Euros.

Results Both groups had similar percentage of ventricular pacing: G1: 72.2±15.6%; G2: 79.2±18.9% and were homogeneous. During follow-up, 10 (27.8%) patients from G2 were hospitalized (AF: 9 and stroke: 1), compared to no hospitalizations in G1. In G1 AF was noted in 35.7% of patients, whereas in G2 in 72.2% ($p<0.05$). In G2 patients statistically ($p<0.05$) more often required anti-arrhythmic drugs (44.4% patients required 2 or 3 drugs). Average 1-year cost of AF therapy including hospitalizations, drug therapy and consultations was 90.25 EUR in G1 and 203.5 EUR in G2 ($p<0.05$).

Conclusions Localization of the ventricular lead has significant influence on the frequency of AF episodes. RVOT localization is significantly more cost-effective.

[02]
OXIDATIVE BALANCE IS DISRUPTED IN A SHEEP MODEL OF PERMANENT ATRIAL FIBRILLATION, LEADING TO INCREASED OXIDATIVE STRESS

I. LENAERTS, L. RUDEL, C. HUYSMANS, P. HOLEMANS, H. HEIDBÜCHEL, R. WILLEMS

UNIVERSITY OF LEUVEN, LEUVEN, BELGIUM

Background Oxidative stress is important in several cardiac disorders, like heart failure and myocardial hypertrophy. We investigated the involvement of oxidative stress in a sheep model of permanent atrial fibrillation (AF).

Method Ewes (N=10) were rapidly atrially paced at 600 bpm for a median of 19 weeks. At the time of sacrifice all animals were in permanent AF for a median of 7 weeks. Non-stimulated sheep served as controls (N=10). The activity of anti-oxidants superoxide dismutase (SOD) and glutathione peroxidase (GPx) was measured in plasma and tissue samples. The expression of Rac1, xanthine oxidase, membrane and intracellular subunits of NADPH oxidase were examined by quantitative PCR. The results were normalized for expression levels of GAPDH. Fold differences between the two groups were calculated based on the cycle threshold values.

Results The activity of GPx as well as SOD in plasma diminished during rapid atrial pacing: respectively from 232±33 to 155±42 nmol/min/ml (baseline vs. 6 weeks pacing; $p=0.014$) for GPx and from 18±4 to 15±3 U/ml (baseline vs. 6 weeks pacing; $p=0.02$) for SOD. In atrial tissue, there was only a significant decline of GPx activity: 121.21±48.2 vs 60.94±23.99 nmol/min/mg protein (control vs. AF; $p=0.000134$). We found no significant difference in atrial SOD activity (control vs. AF; $p=0.77$). mRNA expression of the different membrane subunits of NADPH-oxidase (gp91phox: $p=0.085$; p22phox: $p=0.12$; NOX1: $p=0.061$), as well as the intracellular subunits (p67phox: $p=0.18$; p47phox: $p=0.22$), showed no significant differences between AF and controls. Regulating protein Rac1 and xanthine oxidase expression was also unchanged ($p=0.36$; $p=0.42$ respectively).

Conclusion In this sheep model of permanent AF we found a decreased activity of anti-oxidants, with unchanged protein oxidase mRNA levels. This suggests that the physiological oxidative balance is disrupted, leading to increased oxidative stress, which could be involved in the development of permanent AF.

[03]
MYOFILAMENT FUNCTION OF ATRIAL MYOCYTES IS PRESERVED IN A SHEEP MODEL OF PERMANENT ATRIAL FIBRILLATION

I. LENAERTS, V. BITO, K. VERMEULEN, P. HOLEMANS, H. HEIDBÜCHEL, K. SIPIDO, R. WILLEMS

UNIVERSITY OF LEUVEN, LEUVEN, BELGIUM

Background Permanent atrial fibrillation (AF) in humans has been associated with structural remodelling and loss of myofilaments. Data on intracellular Ca2+ handling and myofilament properties in permanent AF are however scarce.

Methods Ewes were rapidly atrially paced at 600 bmp for a median of 23 weeks and were in permanent AF for 89.6±6 days. Expression of Ca2+ handling proteins was analyzed by immunoblotting. Atrial myocytes were enzymatically isolated. Myocyte shortening was measured using video edge detection software. L-type Ca2+-currents (ICaL) were recorded using whole cell voltage clamp.

Results Atrial myocytes were hypertrophied in AF (AF 187.9±9 µm vs control 140.3 and AF 26.3±0.5 µm vs. control 18.1±0.6 µm, $p<0.01$, AF n=12 vs control n=24). Myocyte shortening was profoundly reduced in AF (-54.8%, $p=0.035$), as were peak Ca2+ transients and I CaL density (-62%, $p<0.01$ and -23.9%, $p<0.01$ respectively, AF n=12 vs. control n=24). We found a decreased protein expression of alfa1c subunit of L-type Ca2+ channel (-68%, $p=0.02$). SR content, measured from the integrated Na+-Ca2+ exchanger (NCX) current during caffeine application, was unchanged (control 1.97±0.27 pC/pF vs. AF 2.02±0.45 pC/pF ($p=0.67$, AF n=12 vs control n=22). Rate of Ca2+ extrusion by NCX from AF cells was increased (+44.5%, $p<0.01$). We found a tendency for increased protein expression of NCX in AF (+48%, $p=0.052$). During the large Ca transients following caffeine application (AF 793±3 nM vs control 833.6±158 nM, $p=0.62$), cell shortening was no longer different between both groups (AF 9.72±0.53 vs control 10.8±0.5, $p=0.29$).

Conclusion In this sheep model of true permanent AF, reduced contractility is due to disrupted Ca2+ handling mechanisms. Maximal intracellular Ca2+ release could normalize cell shortening, suggesting that the myofilament properties are preserved.

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[04]
MYOCARDIAL DAMAGE FOLLOWING ATTACK OF PAROXYSMAL LONE ATRIAL FIBRILLATION

Y. LEE, S. KIM, J. LEE, J. RYU, J. CHOI, K. KIM, S. CHANG

DAEGU CATHOLIC UNIVERSITY MEDICAL CENTER, DAEGU, SOUTH KOREA

Purpose Tachycardia induced myocardial damage was occurred after attack in patients with paroxysmal atrial fibrillation (PAF). The aim of this study was to evaluate the determinant to elevate the cardiac enzyme after attack in patient with PAF.
Methods We enrolled 40 patients with paroxysmal attack of AF and terminated spontaneously or by cardioversion within 7 days. The myocardial damage was defined as elevated CK-MB or troponin I. We divided two groups into elevated cardiac enzyme group (21 patients, 70.3±12.0yr) and normal group (19 patients. 56.2±17.8 yrs). We measured the C-reactive protein (CRP), pro brain natriuretic peptide (pro-BNP), thyroid related hormone like thyroid stimulating hormone (TSH), T3 and free T4, left ventricular ejection fraction (LVEF), left atrial diameter and heart rate during AF.
Results The patients with elevated cardiac enzyme group was older, more elevated pro-BNP, lower TSH level, larger LA diameter and more rapid heart rate compared to those with normal group. There was not different in CRP, pro-BNP, LVEF and history of prior medication between both groups. Logistic regression analysis showed that level of TSH was independent predictors of elevated cardiac enzyme (p=0.066) even though there was statistically not significant.
Conclusions The level of TSH might be negatively correlated with myocardial damage following paroxysmal attack in AF. However, further larger study might be needed.

[05]
THE LEVEL OF THYROID HORMONE MIGHT BE CORRELATED WITH ELEVATED PRO BRAIN NATRIURETIC PEPTIDE FOLLOWING ATTACK OF PAROXYSMAL LONE ATRIAL FIBRILLATION

Y. LEE, S. KIM, J. LEE, J. RYU, J. CHOI, K. KIM, S. CHANG

DAEGU CATHOLIC UNIVERSITY MEDICAL CENTER, DAEGU, SOUTH KOREA

Purpose Plasma pro brain natriuretic peptide (pro-BNP) is elevated in patients with paroxysmal atrial fibrillation (PAF). The aim of this study was to evaluate the determinant to elevate the BNP after attack in patient with PAF.
Methods We enrolled 40 patients (63.6±16.4 yrs, male 18(45%)) with paroxysmal attack of AF and terminated spontaneously or by cardioversion within 7 days. We measured the C-reactive protein, BNP, thyroid hormone like T3 and free T4, left ventricular ejection fraction (LVEF), left atrial diameter and heart rate during AF.
Results The level of BNP was elevated in most of patients (3905.3±7726.2 pg/mL). There were normal LVEF (59.3±10.3%) and LA diameter (39.8±6.9 mm), rapid heart rate (125.6±21.6 bpm) and elevated free T4 level (2.04±2.19 ng/dL). Multivariate regress analysis showed that free T4 (r=0.42, p=0.025) and LVEF (r=0.50, p=0.004) were independent predictors of elevated BNP.
Conclusion The pro-BNP might be more elevated in patients with hyperthyroidism and low LVEF following paroxysmal attack in AF. However, further study might be needed.

[06]
SUPRA-VENTRICULAR RHYTHM MANAGEMENT AFTER SURGICAL PROCEDURE FOR CHRONIC ATRIAL FIBRILLATION

K. IMAI, T. SUEDA, K. ORIHASHI, K. OKADA

CARDIOVASCULAR SURGERY, HIROSHIMA UNIVERSITY HOSPITAL, HIROSHIMA, JAPAN

Objective & methods Because of temporary inflammatory change of atrium during early phase following cardiac surgery, postoperative rhythm management for chronic atrial fibrillation (CAf) is important to keep sinus rhythm and improve the operative outcome. In our institute, we managed postoperative arrhythmia in accordance with our strategy that were 1) temporary bipolar pacing lead was put on the right side of Backmann bundle making it possible to carry on the pacing for more than 2 weeks, 2) when paroxysmal or persistent atrial fibrillation occurred, direct current (DC) defibrillation was employed at least once, 3) when atrial tachycardia (AT) occurred, keep the tachy-arrhythmia with anti-arrhythmic agent and perform EPS and ablation 2 weeks or more after operation. We performed "Hybrid procedure", which have right atrial ablation lines intending to block the macro-reentry circuit in addition to pulmonary vein box isolation, for 36 patients who has been suffered from CAf associated with organic heart diseases such as mitral valve insufficiency (58%). In all cases, postoperative rhythm management was carried out under our protocol and atrial arrhythmias were analyzed in those cases.
Results Immediately after operation, the Af eliminating rate was 97.2%. During follow up period until one post operative month, we need DC-defibrillation in 5 cases (2.9%) for persistent Af or AT, and EPS-ablation in 3 cases (8.6%) for sustained AT. One At was made by incomplete block line and the other were focal AT. Two of those ATs were ablated successfully. Finally, the Af eliminating rate was 91.7% at latest follow up.
Conclusion Careful postoperative rhythm management is important for CAf surgery to find and clear out all atrial arrhythmia including focal AT. Sufficient rhythm management protocol can be a road map for the improvement of success rate following surgical Af procedure.

[07]
UTILITY OF ENDOSCOPY TO REDUCE THE RISK OF ESOPHAGEAL INJURY IN HIGH-RISK PATIENTS UNDERGOING ATRIAL FIBRILLATION ABLATION

Y. CHA, K. MONAHAN, L. PETERSON, D. PACKER

MAYO CLINIC, ROCHESTER, USA

Background Studies have demonstrated a high incidence of esophageal erosions following radiofrequency (RF) ablations for atrial fibrillation (AF), suggesting the current measures for preventing this complication are inadequate. This study was undertaken to assess the role of endoscopy and/or endoscopically directed ultrasound (EDU) for assisting in the management of patients (pts) at high-risk for esophageal thermal injury.
Methods and results 331 pts underwent wide area circumferential RF ablations (WACA) for AF over the last year at the Mayo Clinic. In 13 pts, (age 55±12, male 13, and persistent AF 11/13 (85%)), pre-procedure chest CT and intracardiac ultrasound demonstrated a high-risk location of esophagus opposed to targeted pulmonary veins (PV). Of these, endoscopy was performed to move the esophagus from the line of ablation during energy application to assure completing the linear lesion in 3 pts. Normal-appearing esophageal mucosa without evidence of thermal injury was confirmed at the end of ablation. In 4 pts, cryo ablation was utilized adjunctive to RF ablation at the location close to the PVs. In the remaining 6 pts, complete

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WACA was accomplished in 5 under intracardiac ultrasound guidance and an incomplete right WACA in 1. These 10 high-risk patients underwent endoscope and/or EDU assessment 1-3 days after the ablation and no evidence of esophageal inflammation was found. EDU provided excellent visualization of the esophageal mucosa, musculature, and the neighboring PVs. No patient has developed an atrial esophageal fistula. AF was eliminated in 8/13 (62%) and controlled with drug in 12/13 (92%).
Conclusion This pilot study demonstrates no incidence of esophageal mucosal lesions, when precautious measures undertaken including combined RF and cryo ablation, and intracardiac ultrasound guided intervention. Endoscopic movement of the esophagus appears to be feasible in selected high-risk pts. With these measures, the prevalence of esophageal erosions may be less than recently described.

[08]
OUTCOME AFTER TRIPLE-SITE BIVENTRICULAR PACING IN PATIENTS UNDERGOING CARDIAC RESYNCHRONIZATION THERAPY

R. LENARCZYK, O. KOWALSKI, T. KUKULSKI, M. SZULIK, P. PRUSZKOWSKA-SKRZEP, T. ZIELINSK, S. PLUTA, B. SREDNIAWA, A. MUSIALIK-LYDKA, Z. KALARUS

1ST DEPARTMENT OF CARDIOLOGY, SILESIAN MEDICAL SCHOOL, SILESIAN CENTER FOR HEART DISEASE, ZABRZE, POLAND

Background Cardiac resynchronization therapy (CRT) has become a major breakthrough in a treatment of selected patients with heart failure, however only 60-80% of CRT candidates respond to this therapy.
Aim of the study was to assess if triple-site biventricular pacing is associated with different mid-term outcome compared to the standard (double-site biventricular) resynchronization therapy.
Methods Fifty-four patients with New York Heart Association class III-IV, left ventricular ejection fraction (EF) <35%, and QRS>120 ms were included; twenty-seven subjects were implanted with triple-site pacemakers (TRIV group), twenty-seven with conventional CRT-devices (BIV group). Clinical data, QRS duration, EF, peak oxygen consumption (VO2max) and 6-minute walking distance (6MWD) were screened for inter-group differences at baseline and after 3 months. Responders at follow-up were defined by alive status, no re-hospitalization for heart failure, and by >10% EF, VO2max and 6MWD increase.
Results Two patients (7.4%) from BIV group and none from TRIV group (P=NS) died during 3 months of follow-up period. More significant decrease of NYHA-class (1.4 vs 1.0), higher increment of EF (10.2 vs 4.5%), VO2max (2.9 vs 1.1 mL/kg/min), and 6MWD (98.7 vs 51.6 m, all P<0,05) were observed after 3 months of pacing in TRIV than in BIV group. Response-rate in TRIV group was 96% vs 63% in conventional group (P=0.002). Conclusions: Triple site resynchronization seems to be more beneficial than conventional CRT.

[09]
TISSUE DOPPLER IMAGING IN PATIENTS UNDERGOING CARDIAC RESYNCHRONIZATION THERAPY- SINGLE-CENTER EXPERIENCES

V. KUYIFA[1], A. APOR[1], P. ANDRASSY[2], S. SZILAGYI[1], G. VERESS[1], L. GELLER[1], B. MERKELY

[1]SEMMELWEIS UNIVERSITY, CARDIOVASCULAR CENTRE, BUDAPEST, HUNGARY; [2]BAJCSY-ZSILINSZKY HOSPITAL, CARDIOLOGY DEPARTMENT, BUDAPEST, HUNGARY

Introduction Cardiac resynchronization therapy (CRT) is an established nonpharmacological treatment modality for patients with severe heart failure. However, rate of non-responders is still unacceptably high. Aim of our study: To assess intra- and interventricular dyssynchrony using tissue Doppler imaging (TDI) in patients undergoing CRT.
Methods Intraventricular dyssynchrony was assessed using TDI in the six basal left ventricular segments (septal, lateral, inferior, anterior, anteroseptal, posterior wall), the maximal difference was considered to be significant above 55 msec. Interventricular dyssynchrony was measured as the difference of systolic velocity onset between right ventricular free wall and the latest activated segment of the left ventricle.
Results Fifty-five patients were included in the study (29 ischaemic, 26 dilatated cardiomyopathy). The mean age was 66±8 years, the mean QRS width 174±24 msec, left ventricular ejection fraction 25,3±5,4%. Intraventricular dyssynchrony was detected in 84% of patients, the delay was 95±35 msec. Interventricular dyssynchrony was found in half of the patients (80±26 msec). In 9 patients, earlier implanted pacemaker was upgraded to biventricular system (2 DDD, 1 VDD, 6 VVI PM). In 14 patients (25%) atrial lead was not implanted because of chronic atrial fibrillation. The difference between left and right ventricular leads activation, measured during implantation, was 111±29 msec. After biventricular pacemaker implantation, QRS decreased to 136±21 msec (p<0,001), intraventricular dyssynchrony was abolished, delay was 36±15 msec (p<0,001). Interventricular dyssynchrony also decreased to 46±34 msec (p=0,001). Ejection fraction significantly improved (33±8%, p=0,001). During 5,2±2,8 months follow-up (n=43), 16 percents of patients (n=7) proved to be non-responder (death, heart failure hospitalization, worsening in NYHA functional class). All patients with elimination of intraventricular dyssynchrony were responders.
Conclusions TDI is able to assess dyssynchrony in patients undergoing CRT. Loss of intraventricular dyssynchrony is predictive in CRT patients for being responders.

[10]
IS DIABETES MELLITUS INFLUENCE THE RESYNCHRONISATION THERAPY EFFECT?

S. KUCIA-KUZMA, K. GOSCINSKA-BIS, R. GARDAS, P. NOWAK-MAJDA, M. PRUSKI, W. WILCZEK, B. GRZEGORZEWSKI, W. KARGUL

DEPARTMENT OF ELECTROCARDIOLOGY, MEDICAL UNIVERSITY OF SILESIA, KATOWICE, POLAND

Introduction The aim of the study was to estimate whether diabetes mellitus (DM) influence the resynchronization therapy (CRT) effect three months after implantation.
Material The study has been done on 105 CRT implantation complied standard recommendation to resynchronization therapy. Information on DM was taken from case histories. The response to the therapy was estimated three months after CRT implantation on the basis of clinical examination, echocardiography and six-minutes-walk test. The chance that patients will not respond to CRT for DM group (riskexp) and those without DM (riskunexp), confidence interval (95%CI) and the odds ratio (OD) were estimated. Statistical analysis of data was performed using Chi square test with the Yates improvement.
Results In the group of 105 patients with CRT: 21 person (20%) suffered from DM. After 3 months 20 of 105 patients (19.05%) turned out to be nonresponders, 85 patients (80.95%) were responders.
There were 7 (33.33%) nonresponders in group with DM and 13 (15.5%) in group without DM..
Riskexp was 0.5384 (95%CI: 0.2674÷0.8094) and riskunexp was 0.1972 (95%CI: 0.1046÷0.2897). The odds ratio was 2.73 (95%CI: 0.92÷8.06). Chi square test with the Yates improvement did nor reach statistical significance (p=0.1204).

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Conclusions High odds ratio allowed to conclude that DM may increased the probability of the lack of resynchronisation therapy, although to confirm that further investigation on large group (especially with DM) is needed.

[11]
INTRA- AND INTERVENTRICULAR DYSSYNCHRONY AND MITRAL REGURGITATION IN PATIENTS WITH DILATED CARDIOMYOPATHIES.

B. KRAVCHUK, G. KNYSHOV, V. ZALEVSKIY, O. O.RASPUTNIAK, V. V. BESHLYAGA

AMOSOV NATIONAL INSTITUTE OF CARDIOVASCULAR SURGERY OF THE ACADEMY OF MEDICAL SCIENCES OF UKRAINE, KYIV, UKRAINE

Background It has been clearly demonstrated that cardiomyopathy in congestive heart failure (CHF) patients (pts) often go together with mitral regurgitation (MR). Cardiac resynchronization therapy (CRT) in CHF pts demonstrate clinical improvement and decrease of FMR degree.
Aims We intended to assess the correlation between MR in CHF pts with degree of intra- and interventricular dyssynchrony.
Methods We studied 74 CHF pts with left ventricular (LV) dilatation (18 M, age from 18 to 78 yrs, LV EF 31.9+6.2%, QRS width 168+25 ms). Pts were evaluated by ventriculography. Inter- and intraventricular dyssynchrony were assessed by echocardiography and by endocardial mapping during CRT device implantation. We measured InterVentricular Delay time (IVD), Septo-Lateral Delay Time(SLDT) and tissue Doppler imaging (TDI) for peak velocity time in septum and posterior wall. MR was assessed by the color-coded maximal MR jet in the left atrium in two planes. All patients have mild-to moderate MR. 70 CHF pts were treated with BiV pacing.
Results After six months of BiV pacing in CHF pts we observed reduction of QRS duration, (145+30 vs 168+25 ms $p<0.1$), LV EF (%) increase (31.9+6.2 vs 25.8+5.3, $p<0.1$) with EDV (ml) reduction (248.8+94 vs 286.1+96), ESV (ml) reduction (195+56 vs 240+72, $p<0.1$), IVD reduction (70+37 vs 25+8 ms), SLDT reduction (150+18 vs 86+10 ms) reduction of MR degree (1.3+0.8 vs 2.8+0.7, $p<0.1$).
Conclusions

1. Functional MR in CHF pts is conditioned by intraventricular dyssynchrony, LV geometry worsening and papillary muscles dysfunction.
2. Interventricular dyssynchrony has less influence on MR.
3. Reduction of MR correlates with degree of intraventricular dyssynchrony and non-ischemic CHF.

[12]
THE INFLUENCE OF CARDIAC RESYNCHRONIZATION THERAPY ON HEART RATE TURBULENCE

B. SREDNIAWA, A. MUSIALIK-LYDKA, O. KOWALSKI, R. LENARCZYK, J. KOWALCZYK, S. JUREK, M. SZULIK, Z. KALARUS

1ST DEPARTMENT OF CARDIOLOGY, SILESIAN CENTER FOR HEART DISEASES, MEDICAL UNIVERSITY OF SILESIA, ZABRZE, POLAND

Heart rate turbulence (HRT) reflects barororeflex sensitivity and is regarded as a new factor in the stratification of the patients (pts) for the risk of sudden cardiac death (SCD). HRT has not been investigated in pts treated with cardiac resynchronization therapy (CRT) so far.
Purpose To assess HRT in pts with advanced chronic heart failure (CHF) treated with CRT in 6 months follow-up.
Material and methods The study group consisted of 53 pts (17 F, 36 M; aged 55±8 years) with CHF at NYHA class III-IV, EF below 35% (mean 23.6±6.8%) and significant systolic dyssynchrony of the left ventricle, confirmed by tissue Doppler imaging, in whom BIV pacemakers were implanted. HRT parameters: turbulence onset – TO [%] and turbulence slope TS [ms/RR interval] were assessed based on digital Holter monitoring using HRTView! program. HRT parameters before BIV implantation and 6 months after CRT were calculated. TO>=0% and TS=<2.5 ms/RR interval were admitted as corresponding with high risk for SCD and therefore as abnormal.
Results In the whole group before CRT mean TO was: 0.004±0.02 and after 6 months of CRT its value although has not changed significantly, but reached value below zero regarded as a normal: –0.008±0.007. TS in 6 months of follow-up increased significantly and its baseline value was 2.04±1.8 vs 3.7±3.0 (p=0,0001) after 6 months of CRT. During 6 months of CRT the significant decrease of the percentage of pts with abnormal HRT values was observed.
Conclusions During 6 months of CRT therapy the increase of HRT parameters and the reduction of the number of pts with abnormal HRT are observed. Therefore, CRT may improve baroreflex sensitivity.

[13]
ELECTROCARDIOGRAPHIC PREDICTOR OF EFFICACY OF CARDIAC RESYNCHRONIZATION THERAPY

J. GARCIA-SEARA, L. MARTÍNEZ-SANDE, B. CID-ALVAREZ, M. BASTOS FERNÁNDEZ, R. PÉREZ VIDAL, F. SOTO LOUREIRO, A. VARELA ROMAN, P. RIGUEIRO VELOSO, J. GONZÁLEZ-JUANATEY

CLINICAL HOSPITAL OF SANTIAGO DE COMPOSTELA, SANTIAGO DE COMPOSTELA, SPAIN

Purpose Cardiac Resynchronization Therapy (CRT) benefits symptoms and survival of patients (Pts) with left bundle branch block (LBBB) and left ventricular systolic dysfunction. Pts. with LBBB and normal QRS axis may have different left ventricular activation pattern than Pts. with LBBB and left QRS axis. We evaluated whether the QRS complex axis can predict clinical outcome in Pts. who underwent CRT.
Material and methods We retrospectively evaluated clinical outcome in 53 Pts. referred for CRT. We classified Pts. according QRS axis in Group I: QRS axis between -30º and +120º (34 Pts.) and Group II: QRS axis between -30º and -90º (19 Pts.). The left ventricular lead location was classified into 3 groups: anterior (interventricular vein), lateral (lateral vein) and posterior (posterolateral or middle cardiac vein). We analyzed the relationship between left ventricular lead location and clinical outcome (New York Heart Assocciation class for congestive heart failure) in the two groups.
Results 48 pts. (82.7%) improve after CRT at least one NYHA class during follow-up. Amongst left ventricular lead location, it was anterior in 24 pts. (45.3%), Lateral in 17 pts. (37%) and posterior in 12 pts. (22.6%). Pts. responders were 20/24 (83.3%) in anterior subgroup, 16/17 (94.1%) in lateral and 9/12 (75%) in posterior. In group I, the rate of responders was: anterior 11/15 pts. (73.3%), lateral 9/10 pts. (90%) and posterior 8/9 (88.8%). In group II, the rate of responders was: anterior 9/9 (100%), lateral 7/7 (100%) and posterior 1/3 pts. (33.3%).
Conclusions Implanting left ventricular lead in anterior position has a better clinical outcome in patients with left deviation of QRS axis compared with those with normal QRS axis and it should be taken into account as an alternative to lateral vein location in this kind of patients.

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[14]
NEW PURPOSE TO TREAT HEART FAILURE: STEM-CELLS AND RESYNCHRONIZATION CARDIAC THERAPY

O. GRECO, R. ARDITO, J. JACOB, R. TAKEDA, A. PARRO JR., F. SALLIS, M. LAGO, E. SILVA, A. SANTOS, A. MIOLA, L. RUIZ, M. RUIZ

IMC-INSTITUTO DE MOLESTIAS CARDIOVASCULARES SÃO JOSÉ DO RIO PRETO, SÃO PAULO, BRAZIL

Background In recent years the Cardiac Resynchronization Therapy(CRT) has been a well defined approach for patients with heart failure (HF) in functional class III or IV who do not respond to optimized therapeutics.
Studies have shown efficacy in this stimulation, but one well defined group of dilated myocardiopathies with large areas of fibrosis has not had the same success.
Therefore we have decided to associate the stem-cell (SCT) implant in these patients.
Material and methods Since April 2005 we have started to implant CRT and SCT in patients with HF, NYHA III/IV, optimized and ejection fraction (Echo) ≤35% and ventricle dissynchrony, in 23 patients (16 males) mean age 58 and 45% with of chagasic ethiology.
RCT and SCT were performed via epicardial (12) or endocardial (11), the selection of the cells with filtration by FICOLL and infused mean number of $3.0x10^8$, Cells: CD 34+ ($5.0x10^6$) e CD 133+ ($2.5x10^6$).
Results In 24 months of evolution we have noticed that 84.8% of these patients remained alive and the mortality (15.2%) was not related with the procedure
By Kaplan-Meier curve in this group (84.8%) it is superior to another similar group that did not have pacemaker implants (52.4%), chagasic patients survived less than the ischemic and the idiopathic patients: 42.4%, 55.6% e 77.2%, respectively. In spite of these initial differences, there is no statistical difference in these samples, with log-rank test of: P=0.218 e P=0.626, respectively.
Conclusion In cases that the RCT separately does not seem to have a good result, we choose the association of SCT as a safe and adequate alternative for these severe patients with HF and dilated myocardiopathy.

[15]
INITIAL RESULTS OF THE SPANISH REVEAL REGISTRY

F. LACUNZA-RUIZ[1], A. GARCÍA-ALBEROLA[1], G. BARON-ESQUIVIAS[2], J. MARTINEZ-ALDAY[3], A. MOYA[4], R. RUIZ-GRANELL[5], J. OLALLA[6], J. VILLACASTIN[7]

[1]UNIVERSITY HOSPITAL VIRGEN DE LA ARRIXACA, MURCIA, SPAIN; [2]UNIVERSITY HOSPITAL VIRGEN DEL ROCIO, SEVILLA, SPAIN; [3]SAN SEBASTIAN CLINIC, BILBAO, SPAIN; [4]UNIVERSITY HOSPITAL VALL D'HEBRON, BARCELONA, SPAIN; [5]UNIVERSITY HOSPITAL CLINIC, VALENCIA, SPAIN; [6]UNIVERSITY HOSPITAL MARQUES DE VALDECILLA, SANTANDER, SPAIN; [7]UNIVERSITY HOSPITAL CLINICO, MADRID, SPAIN

Backgrounds The insertable loop recorder (ILR) has shown to be a useful tool in the diagnosis of syncope, but it may help in the diagnosis of other paroxysmal conditions potentially related to arrhytmia, such as palpitation and dizzines. The objective of this study was to evaluate the indication of the ILR in real routine clinical practice.
Methods 38 centers have participated in a nation-wide registry of patiens undergoing implant of an ILR for clinical reasons, between April 2006 and April 2007. We analyzed demographic and clinical characteristics, and the reason for the indication of the device.
Results 287 patients were included. Baseline characteristics are presented in table 1.41% of the patients had previous documented arrhytmia. Electrophysiologic study was performed in 136 patients (47%) and tilt test in 84 (31.4%; positive response in 26 (31%)). The clinical indication for the ILR was recurrent syncope in 208 (72.5%), isolated syncope in 40 (13.9%) and other in 24 (8.3%). Patients with isolated syncope had a higher prevalence of structural heart disease (51% vs 31%; p<0.01). The implant of the device was performed by a cardiologist in 90.4% of the cases. Only two minor complications were reported.

TABLE 1

Men (%)/Women	158 (55.1%)/129
Age (y)	67.2±14.8
Hypertension	132 (50%)
Diabetes	44 (16.8%)
Structural heart disease	97 (36.3%)
LVEF <0.55	36 (15.2%)
<0. 35	4 (1.5%)
Neurologic disease	30 (11.4%)
Abnormal ECG	129 (48.3%)
Intraventricular conduction disturbance	73 (27.3%)

Conclusion The main indication for ILR implantation in routine clinical practice is recurrent syncope. A high prevalence of structural heart disease and previous documented arrhythmias were observed in this population.

[16]
NEW INSIGHTS INTO CAVOTRICUSPID ISTHMUS ANATOMY IN HUMAN HEARTS. IMPLICANCIES FOR CATHETER ABLATION.

Á. RIVARA[1], S. LAZA[2], M. POUMAYRAC DE MASREDON[2], B. VILLAR[2], N. DELEÓN[2], M. VERGARA[2], D. FREIRE[1], A. CIRILLO[1], R. LLUBERAS[2], V. SORIA[2]

[1]DEPARTAMENTO DE CARDIOLOGÍA, HOSPITAL DE CLÍNICAS, MONTEVIDEO, URUGUAY; [2]DEPARTAMENTO DE ANATOMÍA, FACULTAD DE MEDICINA, MONTEVIDEO, URUGUAY

Background The cavotricuspid isthmus (CTI) is a pivotal structure for atrial flutter (AFL) and catheter ablation of this arrhythmia.
Purpose We studied morphologic aspects of the CTI in human hearts with possible implicancies for catheter ablation of AFL.
Method Thirty four post mortem fixed human hearts were analyzed. The CTI was defined as the area between the orifice of the inferior vena cava (IVC), coronary sinus (CS) ostium and tricuspid annulus (TA). The CTI was dissected and composition of the atrial wall was examined and analyzed from the epicardial and endocardial surfaces, with emphasis on myocardial bundle (MB) disposition and architecture. Histologic analysis was performed.
Results Average length of the CTI was 2.3 cm (1.2 – 3.1 cm). In the epicardial surface of the CTI, the presence of MB coming from the CS was constant. Macroscopic and histologic analysis revealed that myocardial sleeves coming from the left heart were separated of the right atrium by fibrofatty tissue. These muscle bundles coming from the CS became subendocardial and prolonged onto the Eustachian valve. The endocardial aspect of the CTI showed a constant pattern of the terminal portion of the crista terminalis, dividing in 2 to 6 terminal branches (average 3.5).
Conclusions The CTI lenght is variable, and is formed by muscle belonging to the right atrium in its endocardial aspect and by myocardial fibers coming from the CS in the epicardial aspect. This heterogeneous composition has not been described previously and suggests a complex nature of the inferior interatrial pathway with implicancies for catheter ablation of CTI-dependent AFL.

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[17]
LEFT ATRIAL VOLUME INDEX MIGHT BE ASSOCIATED WITH RECURRENCE OF ATRIAL FIBRILLATION AFTER ABLATION OF TYPICAL ATRIAL FLUTTER

Y. LEE[1], D. HYUN[2], B. CHUNG[3], Y. JO[4], D. SHIN[5], Y. KIM[6]

[1]DAEGU CATHOLIC UNIVERSITY MEDICAL CENTER, DAEGU, SOUTH KOREA; [2]KONYANG UNIVERSITY MEDICAL CENTER, DAEJEON, SOUTH KOREA; [3]DAEGU FATIMA HOSPITAL, DAEGU, SOUTH KOREA; [4]KYUNGPOOK UNIVERSITY MEDICAL CENTER, DAEGU, SOUTH KOREA; [5]YEUNGNAM UNIVERSITY MEDICAL CENTER, DAEGU, SOUTH KOREA; [6]KEYMYUNG UNIVERSITY DONGSAN MEDICAL CENTER, DAEGU, SOUTH KOREA

Purpose Radiofrequency catheter ablation of the cavotricuspid isthmus (CTI) has been known as an effective therapy of typical atrial flutter (AFL) and atrial fibrillation (AF). AF and AFL often coexist. However, AF which was usually not presented was often occurred following successful ablation of CTI. The aim of this study was to investigate the predictor of concomitant AF following successful ablation of AFL.
Methods We enrolled 120 patients (59.1±11.3 yrs, male 98 (81.7%)) with typical AFL, who received successful ablation of the CTI. They were followed up at outpatient clinic (15.5±17.7 months, range 3 to 105 months). The 12-lead ECG and Holter monitoring were used to confirm the diagnosis of recurrent AFL or AF. We assessed prior AF history, structural heart disease, left ventricular ejection fraction, left atrial diameter (LAD), left atrial volume index (LAVI) and AFL cycle length.
Results Among the 120 ablated patients, 14 (11.7%) patients had recurrent AFL and 30 (25.0%) had recurrent AF. Multivariate logistic regression analysis found that the independent predictors of recurrent AF were LAD and LAVI. The LAD of 4.5 cm and LAVI of 42.6 mL may allow for the differentiation between only AFL and AFL with concomitant AF with 72.7%, 77.3% of the sensitivity and 64.9%, 68.4% of the specificity, respectively.
Conclusions LAVI might be useful predictor for differentiation AFL with concomitant AF from only AFL. However, further larger study might be needed.

[18]
RIGHT ATRIAL ISTHMUS DEPENDENT ATRIAL FLUTTER CYCLE LENGTH CORRELATES WITH RIGHT ATRIAL CROSS SECTIONAL AREA

K. KRISHNAN, A. GUPTA, D. CHAWLA, S. HALLERAN, R. TROHMAN

RUSH UNIVERSITY MEDICAL CENTER, CHICAGO, USA

It is well known that right atrial flutter cycle length can prolong in the presence of antiarrhythmic drug therapy. We hypothesized that the cycle length of right atrial isthmus dependent flutter would correlate with right atrial cross-sectional area measurements. 88 consecutive patients who underwent ablation for electrophysiologically proven isthmus dependent right atrial flutter and who were not on any Class I or Class III antiarrhythmic drugs were screened. Of these, 38 patients had recent 2-dimensional echocardiographic data and comprised the study group. Right atrial flutter cycle lengths were measured and dichotomized to atrial rates greater than or equal to 250 bpm or less than 250 bpm. The right atrial length and width dimensions were measured in the apical four chamber view. A cross-sectional area calculation was made by multiplying the length and width. Statistical analysis was performed using unpaired t tests. 25 patients had an atrial flutter rate greater than or equal to 250 bpm (Normal Flutter Rate) and 13 patients had an atrial flutter rate less than 250 bpm (Slow Flutter Rate). The mean atrial flutter rate was 283 bpm in the Normal Flutter group and 223 bpm in the Slow Flutter Group (P<0.0001). The mean atrial flutter cycle length was 212 ms in the Normal Flutter Group and 268 ms in the Slow Flutter Group (P<0.0001). The mean right atrial cross sectional area was 1931 mm2 in the Normal Flutter group and 2517 mm2 in the Slow Flutter Group, p=0.032. It appears that, in the absence of antiarrhythmic medications, right atrial cross sectional area enlargement correlates strongly with atrial flutter rates below 250 bpm. This study provides evidence that historical definitions of typical isthmus dependent right atrial flutter may require revision.

[19]
QUALITY OF LIFE EVALUATION IN DEPENDENT CAVOTRICUSPID ISTHMUS FLUTTER ABLATION

J. GARCIA-SEARA, L. MARTÍNEZ SANDE, B. CID ALVAREZ, R. VIDAL PEREZ, F. GUDE SAMPEDRO, F. SOTO LOUREIRO, E. GONZALEZ BABARRO, J. GONZALEZ-JUANATEY

CLINICAL HOSPITAL OF SANTIAGO DE COMPOSTELA, SANTIAGO DE COMPOSTELA, SPAIN

Purpose To assess the impact in quality of life (QOL) of patients who underwent dependent cavotricuspid isthmus atrial flutter ablation (DCIAF).
Material and methods We analyzed prospectively 95 patients (pts) diagnosed with DCIAF and referred to our Electrophysiology Laboratory. We assessed QOL by using the Medical Outocomes Study Short Form Healthy Survey (SF36) questionnaire in the basal state previously to the procedure and at 1 year follow-up. We excluded from the analysis patients with non DCIAF and those with life expectancy less than 1 year.
Results We eventually included 88 pts. There were 8 deaths (7.6%) during the follow-up. We studied the change in QOL using the Wilcoxon test. We observed an improvement in all QOL items: Physical Functioning: 74 pts. (84%) improved with a mean of improvement (M) of 24.4. and standard deviation (SD) 21.0, p<0.000, Physical Role Function: 58 pts (66%) improved with a M of 45.0 and SD 45.6 p<0.000, Bodily Pain: 34 pts (39%) improved with a M of 9.8 and SD 31.9, p<0.006, General Health: 68 pts (77%) improved with a M of 15.3 and SD 19.3, p<0.000, Vitality: 67 pts. (76%) improved with a M of 25.0 and SD 24.0, p<0.000 Social Role Function: 47 pts. (53%) improved with a M of 16.5 and SD 25.1, p<0.000, Emotional Role Function: 39 pts. (44%) improved with a M of 31.4 and SD 40.5, p<0.000, Mental Health: 72 pts. (82%) improved with a M of 17.8 and SD 23.0, p<0.000 and Health Transition: 81 pts (92%) improved with a M of 2.0 and SD 1.1, p<0.000.
Conclusion DCIAF ablation causes a significant improvement in all QOL items evaluated in SF 36 questionnaire. The improvement is independent of the type of flutter (paroxysmal vs persistant) and the presence of atrial fibrillation as a concomitant arrhythmia.

[20]
CATHETER ABLATION OF ATRIAL TACHYCARDIA AFTER MAZE OPERATION WITH CRYO-ABLATION

Y. HATA, T. KAMIJIMA, H. NAKAJIMA, Y. NISHI, M. KAGEYAMA, N. KANEKO

DOKKYO MEDICAL UNIVERSITY, SHIMOTUGA, JAPAN

Background Maze operation with cryo-ablation is frequently applied for a patient with atrial fibrillation undergoing concomitant cardiac surgery. Atrial tachycardias (ATs) after this procedure, which substrate were not well characterized, have been reported. The purpose of this study was to evaluate ATs after maze operation with cryo-ablation and ablate them.
Methods and Results Maze operation with cryo-ablation and concomitant surgical repair was performed in 46 patients from 2002 to

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2004. Four patients (8.7%, 3 females, mean age 61±2.7 years) developed AT in 6-180 days after surgery (1pt ASD closure, 2pts mitral valve plasty, 1pt OMC) were studied. CARTO map of RA and LA was obtained during AT in every patient. Four ATs were identified as macro-reentrant tachycardias (mean ATCL 281±24 ms) in RA (1 AT) or LA (3 AT); 1 used isthmus between right line of block and RA incision, 2 used mitral isthmus, 1 used gap on line of block created imperfectly with reentry circuit in left posterior wall. ATs were eliminated by linear ablation to the isthmus and gap and became noninducible in all patients. There was no AT recurrence in all patients during follow-up 21-37 months.
Conclusion The isthmus and gap formed at surgery may become arrhythmogenic substrates, and to identify these isthmus and gap may be significant for catheter ablation of AT after maze operation with cryo-ablation.

[21]
ELECTROPHYSIOLOGICAL MYOCARDIAL CHARACTERISTICS AND THEIR VARIATIONS IN PATIENTS WITH LQT1 AND LQT2 REVEALED BY THE BODY SURFACE MAPPING

I. POLYAKOVA[1], L. KALININ [2], S. CHUPROVA[2], M. SHKOLNIKOVA[2]

[1]BAKOULEV SCIENTIFIC CENTER FOR CARDIOVASCULAR SURGERY, MOSCOW, RUSSIA; [2]THE CHILDREN'S SCIENTIFIC-PRACTICAL CENTER OF ARRHYTHMIAS, INSTITUTE OF PEDIATRICS AND CHILDREN'S SURGERY, MOSCOW, RUSSIA

Generally accepted all forms of the long QT syndrome (LQTS) involve an abnormal repolarization of the heart. Purpose: to evaluate features of de- and repolarization processes in children with LQTS by studying a body surface mapping potential distributions of QRS and ST-T intervals. Patients (pts) – 27 children with congenital LQTS (16 girls, 11 boys), aged from 6 to 17 y.o. (12.1±2.8): 17 children with LQT1 (KvLQT1), and 10 children with LQT2 (HERG). Control group – 20 children without cardiac arrhythmia (7 girls, 13 boys), aged from 5 to 17 y.o. (14.7±2.9). Methods: computer electrocardiographic system "Cardiag" (Czech) with ECG registration in 80 unipolar leads was used for body surface potential mapping. Isopotential and isointegral maps of QRS complexes and ST-T intervals were calculated. Result: Specific features of body surface potential distributions in children with LQT1 consist in the additional de- and repolarization extrema; body surface maps in children with LQT2 are characterized by the widespread negative depolarization area, wide and dislocated negative repolarization zone. In LQT1: the depolarization abnormalities were revealed in 70% of genetically tested pts (n=10), the repolarization abnormalities - in 60%, both – in 50%. In genetically nontested LQT1(n=7) -71%, 57% and 57%, respectively. In LQT2: the depolarization abnormalities were revealed in 100% of genetically tested pts (n=3), the repolarization abnormalities - in 100%, both – in 100%. In genetically nontested LQT2 (n=7) - 43%, 86% and 30%, respectively. Conclusion: Body surface potential mapping reveals specific abnormalities of both repolarization and depolarization of the ventricles of the heart in children with congenital LQTS. This study could be helpful for the understanding of cardiac electrophysiology disorders in these pts and for identification of LQT1 and LQT2 pts in practice before performing molecular genetic studies.

[22]
FOLLOW UP OF CHILDREN WITH LONG QT INTERVAL

V. MILOVSKY[1,2,3], E. BALAZOVA[2], M. LAKOMY[2], V. ILLIKOVA[2], V. TAZKY[4]

[1]CONSTANTINE THE PHILOSOPHER UNIVERSITY, NITRA, SLOVAK REPUBLIC; [2]CHILDRENS CARDIAC CENTRE, BRATISLAVA, SLOVAK REPUBLIC; [3]SLOVAK MEDICAL UNIVERSITY, BRATISLAVA, SLOVAK REPUBLIC; [4]HOSPITAL OF MINISTRY OF DEFENSE, BRATISLAVA, SLOVAK REPUBLIC

Long QT syndrome is inherited arrhythmia with specific ventricular tachycardias, syncope and/or sudden death.
Group of patients (pts): In the years 1993-2005 we followed up 15 girls and 11 boys from 22 families. 14 pts had affected relatives. First symptoms appeared at the age of 4 to 15 years. 9 pts had tachycardias, 8 had syncope, another 3 pts had chest pain. 6 pts were resuscitated and 3 other were symptomless. Sudden cardiac death in relatives occured in 8 males. Diagnosis was made on the basis of prolonged QTc on ecg, shape of T waves, and Schwartz score. 17 pts were genetically tested.
Results According to the Schwartz diagnostic criteria, 2 pts had 1.5 points, 5 pts - 4 points, 8 pts up to 7.5 points, 8 pts – up to 10 points and 3 pts more than 10 points. 21pts had LQTS 1, 3pts had LQTS 2, 1pt – LQTS 3 and 1 pt - LQTS 7.
Ventricular tachycardia (Torsade de pointes) was provoked in 13, i.e. in 50% of pts after bradycardia, alternating short-long cycles, and/or T wave alternans. Ventricular extrasystoles were provoked in another 5, i.e. in 19.3% of pts. Tachycardia was not provoked in the rest of pts.
Treatment: 6 pts were untreated. 2 of them with proved LQTS 2 refused any therapy. 21 pts received metoprolol. Pacemakers were implanted in 5 pts, and AICD in 3 pts after resuscitated syncope.
Follow up 3 pts with pacemaker, died suddenly, one of them after car accident. The rest is symptomless.
Conclusion Therapy with betablocker and pacemaker did not shorten QTc interval in majority of our pts. Pacemaker and betablocker therapy did not prevent from sudden death, AICD was implanted in selected patients.

[23]
CARDIAC PACING IN YOUNG ADULTS WITH KEARNS - SAYRE SYNDROME - HOW FAST IS THE AV BLOCK PROGRESSING?

R. CIUDIN[1], I. GHIORGHIU[1], C. CAPRARU[1], A. NICOLESCU[2], C. GINGHINA[1]

[1]C.DAVILA UNIV. OF MEDECINE, INSTITUTE OF CARDIOVASCULAR DISEASES, BUCHAREST, ROMANIA; [2]PEDIATRIC DEPARTMENT, FUNDENI HOSPITAL, BUCHAREST, ROMANIA

Background Kearne-Sayre syndrome (KSS) is an extremely rare neuromuscular disorder with an onset before of 20 years. KSS is a result of DNA of mytochondria abnormalities and it is characterised by mild skeletal muscle weakness and progressive limitation of eye movements with eyelid drop, diabetes and renal impairement.
Materials and Methods We present 2 young adults, a 15 y old boy and 17.8 year girl genetically diagnosed with KSS. The boy had progressivlly left bundle brunch block (LBBB) and 1st degree AV block and over a period of 18 months he developed 2nd degree AV block and intermittently 3rd degree AV block. He also had non sustained ventricular tachycardia. At 4 years since his pacemaker implant he developed complete heart block with intermitent very slow ventricular escape rhythm at 27 bpm.
The girl was diagnosed initially with 2nd degree AV block and developed 3rd degree AV block after 2 years of follow up. She is been followed up now for 7.5 years since her pacemaker implant.

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Both pts are doing fairely well but the boy developed renal failure.
Conclusions We conclude that KSS patients require early pacemaker implant as different conduction disturbancies have a rapid and unexpected evolution to complete AV block.

[24]
HEROIN OVERDOSE AND BRUGADA ELECTROCARDIOGRAPHIC PATTERN: CLINICAL CASE

A. CAMPANA[1], M. BRIGANTE[1], D. LO PARDO[2], G. MELCHIORRE[1], M. RISPOLI[3], S. FERRARA[1]

[1]HEART DEPARTMEN, SAN GIOVANNI DI DIO E RUGGI D'ARAGONA HOSPITAL, SALERNO, ITALY; [2]INTENSIVE CARE UNIT, SAN GIOVANNI DI DIO E RUGGI D'ARAGONA HOSPITAL, SALERNO, ITALY; [3]TERRITORIAL MEDICINE ASL SA 2, SALERNO, ITALY

Introduction In 1992, Brugada and Brugada first described a syndrome characterized by right bundle branch block and ST segment elevation in the right precordial leads, in patients with no structural heart disease and episodes of syncope or aborted sudden death. In 1998, Chen et Al. identified the first mutation linked to Brugada Syndrome (BS) in SCN5A, the gene encoding · subunit of sodium channels; nevertheless, SCN5A mutations can be detected only in 18 to 30% of patients affected by the syndrome. Several drugs and some particular conditions have been involved in development of transient ST segment elevation (acquired forms of BS). To our knowledge, heroin has not been previously involved in the expression of Brugada-type EKG pattern.
Case report A 40 year old man, known to be drug user, was admitted to our Hospital because he was found unconscious. Upon presentation at the emergency room, Naloxone and Flumazenil were given intravenously; afterwards, oro-tracheal intubation was carried out. The urinalysis revealed the presence of opiates; EKG showed sinus rhythm with a Brugada pattern type 1. Twelve hours after Intensive Care Unit admission, patient was extubated; a new EKG showed still a Brugada pattern. EKGs during the following days showed a progressive resolution of initial pattern, with a complete normalization on the sixth day. A challenge test with Flecainide did not produce significant changes compared with basal EKG. The patient was subsequently discharged; an EKG registered after two months showed again a type 1 Brugada pattern. A genetic test, carried out with DHPLC technique couldn't find mutations of gene SCN5A.
Conclusions Though evidence exists that deaths by unintentional drug overdose are essentially due to a respiratory distress syndrome, it can't be ruled out the possibility of lethal cardiac arrhythmias; Brugada pattern induced by heroin could act as facilitating substrate in triggering reentrant ventricular arrhythmias.

[25]
USEFULNESS OF A LONG-STRAIGHT SHEATH FOR ATRIAL LEAD INSERTION AT THE RIGHT ATRIAL SEPTUM

N. NISHII, K. KUSANO, K. MIYAJI, S. HIRAMATSU, T. TADA, M. MURAKAMI, K. BANBA, S. NAGASE, K. NAKAMURA, S. SAKURAGI, T. OHE

DEPARTMENT OF CARDIOVASCULAR MEDICINE, OKAYAMA UNIVERSITY GRADUATE SCHOOL OF MEDICINE, OKAYAMA, JAPAN

Background Pacing at the right atrial septum (RAS) appears superior to that at the right atrial appendage for preventing paroxysmal atrial fibrillation and for reducing complications as pericarditis, perforation, pneumothorax or diaphragmatic stimulation. However, atrial lead insertion at the RAS is difficult and time-consuming. Although a few useful devices have been reported, handling of the atrial lead around the RAS is sometimes difficult even if those devices are used. Therefore, we attempted to use a long-straight sheath (LSS) to secure sufficient space for handling the atrial lead around the RAS.
Objectives To evaluate the usefulness of an LSS for atrial lead insertion at the RAS.
Methods Seventy-six consecutive patients who underwent insertion of an atrial lead at the RAS from a left-sided approach were divided into the two groups: a first term group without an LSS (non-LSS group) and a second term group with an LSS (LSS group).
Results The success rate of atrial lead insertion was significantly higher in the LSS group than in the non-LSS group [50/52 (96.1%) vs 13/24 (54.2%); $p<0.01$]. The operation time was significantly shorter in the LSS group (13.6±9.1 min vs 32.7±11.1 min; $p<0.01$). There were no differences in the pacing and sensing parameters between the two groups. However, P wave duration was significantly shorter during RAS pacing than during normal sinus rhythm in both groups (non-LSS group: 116±14 ms vs 128±7 ms, $p<0.01$, LSS group: 112±13 ms vs 125±11 ms, $p<0.01$).
Conclusion We conclude that the LSS technique is useful for atrial lead insertion at the RAS because sufficient space for lead handling can be secured by using the LSS.

[26]
MODIFIED FLOUROSCOPIC GUIDED AXILLARY VEIN PUNCTURE DURING DEVICE IMPLANTATION: ACUTE AND MID TERM RESULTS

R. YADAV, N. NAIK, S. CHANDRA, G. SHARMA, R. JUNEJA, K. GOSWAMI, V. BAHL

ALL INDIA INSTITUTE OF MEDICAL SCIENCES, NEW DELHI, INDIA

Background Axillary vein puncture (AVP) avoids many of the problems associated with subclavian vein puncture for pacemaker and device lead implantation. We described our new technique i.e modified flouroscopy guided axillary vein puncture using Seldinger technique and its mid term results.
Methods 300 consecutive patients who underwent permanent pacemaker, ICD and CRT±D implantation were included in the study (220 males, age ranging from 11 – 94 years). 140 patients received single chamber pacemakers, 96 dual chamber pacemakers, 35 had ICD implants, 22 had CRT, and 7 underwent CRT+D. An incision was given 2 cm below clavicle, 1 cm medial to deltopectoral grove. AVP puncture was performed using introducer needle, positioning the needle at an angle of 60 degrees to the plane of skin and guiding it towards the first rib at the junction of outer border of first rib and clavicle. The axillary vein was punctured 0.5 – 1 cm below this fluoroscopic landmark. If the first pass was unsuccessful, the needle and syringe were moved either medially or laterally and the maneuver was repeated until the vein was entered. If repeated attempts were unsuccessful then contrast venography was done to localize the axillary vein. Rest of the procedure was done as per routine practice.
Results AVP was successful in all but 4 patients. In 285 patients, AVP was done using only fluoroscopic guidance. In 11 patients, contrast venography guided AVP was done because of failure to do with fluoroscopic guidance. No patient developed pneumothorax or any other acute complications. During a mean follow up of 15±9.2 months, no patient developed lead fracture or other lead related problems.
Conclusions Fluoroscopic guided AVP is both effective and safe with some learning curve. Lead crush syndrome is not seen with this route of lead placement.

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[27]
SYSTEMATIC REIMPLANTATION AFTER INFECTED LEADS EXTRACTION?

S. BOVEDA[1], E. MARIJON[1], P. BORDACHAR[2], S. ESSADKI[1], O. VAHDAT[3], L. SIDOBRE[3], J. ALBENQUE[1], C. GOUTNER[1]

[1]DEPARTMENT OF CARDIAC PACING, PASTEUR CLINIC, TOULOUSE, FRANCE; [2]DEPARTMENT OF CARDIOLOGY, HAUT LÉV QUE UNIVERSITY HOSPITAL, BORDEAUX, FRANCE; [3]DEPARTMENT OF CARDIAC SURGERY, PASTEUR CLINIC, TOULOUSE, FRANCE

Purpose Infection complicates implantation of permanent pacemaker in approximately 1% of cases. Because these patients may be more likely to have subsequent episodes of infection, the decision for reimplantation of a device should be seriously discussed. We report the 6-months follow-up of non reimplanted patients after removal of infected endocardial leads.
Methods We report a retrospective serie of 105 consecutive patients with infected pacing material, extracted from January 2004 to January 2006. All leads were removed in the operative room, under general anesthesia. Laser-assisted sheath (Spectranetics) and/or lasso (Cook) were used if conventional extraction techniques with simple traction or locking stylet (Spectranetics LLD) had failed. Only patients with ventricular rate <50 bpm underwent reimplantation of a pacemaker. Endocardial pacing was replaced immediately by epicardial pacing, or by endocardial pacing after prolonged antibiotherapy. In both cases, the patients were followed every 3 months.
Results Of the 105 patients (116 ventricular and 89 auricular leads), 56 had local infection of the device, and 49 endocarditis defined by presence of vegetations on endocardial leads. The mean age of patients was 73.7±8.9 years (20-95), and 81% were male. Initial pacing indication was auriculo ventricular block in 48 cases, sinus dysfunction in 53 cases, and cardiac failure in 4 cases. There were no procedure related deaths and major complications. New implantation was performed in 70 patients (18 epicardial pacing, 52 differed controlateral endocardial pacing). Among the 35 non reimplanted patients, initial indication was sinus dysfunction (27 cases), low degree auriculo ventricular block (6 cases), and cardiac failure in 2 cases. Six-months follow-up of these patients was eventless.
Conclusion Reimplantation after extraction of endocardial infected leads doen't have to be systematic. It must be discussed in each case, considering initial indication, spontaneous ventricular frequency, and symptoms during follow-up.

[28]
IMPLANT FLUOROSCOPY TIME USING THE LOCATOR® STEERABLE STYLET IN LEAD PLACEMENT ON ATRIAL SEPTAL WALL

S. COMPTON

ALASKA HEART INSTITUTE, ANCHORAGE, USA

Clinical trials have shown the benefit of atrial pacing at the septal wall versus other locations in the atrium. The study aims to evaluate the effectiveness of the Locator® Steerable Stylet in reducing fluoroscopy times while positioning leads at the atrial septal wall. This is a prospective, multi-center, acute, randomized comparison study. Each patient was randomized for the implanting physician to either use the Locator® Steerable Stylet or a conventional lead placement device chosen by the physician. The fluoroscopy time was collected via case report forms. This pt cohort consisted of 41 pts (68% male, 76.3±9.4 yrs). The average total fluoroscopy times for placement of the atrial lead for the conventional and Locator® Steerable Stylet were 194.4±240.0 sec and 101.6±96.1 sec respectively (p<.001). Fluoroscopy time during implant of the atrial lead is reduced by 48% when using the Locator® Steerable Stylet for lead placement in the atrial septal wall location.

[29]
CARDIAC PACING VIA LEFT SUPERIOR VENA CAVA WITH ABSENT RIGHT SUPERIOR VENA CAVA.

V. ZALEVSKIY, B. KRAVCHUK, A. LOZOVYI, O. PARATSIY

AMOSOV NATIONAL INSTITUTE OF CARDIOVASCULAR SURGERY OF THE ACADEMY OF MEDICAL SCIENCES OF UKRAINE, KYIV, UKRAINE

Background Left superior vena cava (LSVC) with coexisting absent right superior vena cava (RSVC) is very rare finding. Less than 150 cases were described in the literature.
Methods and results In our experience we observed three cases of LSVC with absent RSVC. First patient – woman, 54 year old with complete A-V block (CAVB) 10 days after mitral valve replacement was underwent SSIR pacemaker implantation using lead for left ventricle pacing (Corox LV, Biotronik) and lead was introduced in posterolateral cardiac vein. For second pt (man, 61 y.o.) with CAVB we implanted DDD pacemaker with active fixation lead (Actifix, Vitatron) in atrium and J-shaped lead (Isoflex, St.Jude.Medical) in posterolateral cardiac vein. In third case for 79 y.o. man with CAVB and atrial fibrillation we implanted SSI pacemaker left ventricle lead (Corox LV, Biotronik) which was positioned in middle cardiac vein. For all operation we finally used left side approach, but for each case we tried to cannulate right subclavian vein before using described technique. There were not complications during interventions. The intraoperative measurements show acceptable parameters for ventricle leads:
– 1 pt - pacing threshold (PT) -0,5V with duration 0,5 ms, sensing threshold (ST) – 16 mV;
– 2 pt - PT-0,8V with duration 0,5 ms, ST – 9 mV;
– 3 pt - PT-0,7V with duration 0,5 ms, ST – 11 mV.

In mean follow-up 75±24 days we observed any complications and chronic thresholds were: 1-3,5V with duration 1,0 ms; 2- PT-1,4V with duration 0,5 ms; 3-1,0V with duration 0,5 ms.
Conclusions Cardiac pacing via PLSVC with absent RSVC is possible with good results in late follow-up. Selective epicardial approach via cardiac veins could be used for ventrical pacing. For atrial pacing in such situation active fixation leads are preferable. Coronary sinus angiography should be performed for vein anatomy investigation.

[30]
LONG TERM FOLLOW UP OF A SINGLE COIL DEFIBRILLATION ELECTRODE IN HIGH SEPTAL POSITION (MEDTRONIC 6931 SPRINT FIDELIS)

A. KLOPPE[1], G. HEIMLICH[2], B. GUENESDOGAN[1], M. ZARSE[1], B. LEMKE[1]

[1]DEPARTMENT OF CARDIOLOGY AND ANGIOLOGY, KLINIKUM LUEDENSCHEID, LUEDENSCHEID, GERMANY; [2]MEDTRONIC GMBH, DUESSELDORF, GERMANY

Background Pacing at the traditional site for ventricular pacing, the right ventricular apex, produces an abnormal pattern of ventricular depolarization and there is growing evidence that pacing from this site is associated with adverse functional and structural changes of the left ventricle. Large numbers of small sized studies have evaluated the alternative site pacing. The downsized (6.6 Fr.) Sprint Fidelis™ lead family allows to place a defibrillation lead in the high septal region of the right ventricle.
Methods The Medtronic 6931 Sprint Fidelis™ single coil active fixation lead has an isodiametric lead body of 6.6 Fr., with polyurethane overlay and passes through a 7.0 Fr. introducer. We prospectively analyzed data from 16 CRT-D systems using this lead in a single center.
Results This electrode was implanted in 16 consecutive patients (12 male, 4 female), The average age was 69±6years. NYHA class II-IV. 12 patients had a CAD, 4 a DCM, 7 patients had prior myocardial

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infarction. The EF 25.8±6.6%, the LVEDD was 65.31±6.6 mm, the LVESD was 59±5.9 mm. There was no difficulties during implantation and no dislodgement during follow up. All patients were effectively tested during implant with 2 consecutive shocks 10J below maximum. The events/shocks documented during followup were successful. Sensing during implant was 11.4±4.7 mV, Threshhold 0.75±0.22 V, impedance 778±119 Ohm and shock impedance 57±15 ohm. These values changed insignificantly after 3, 6 and 9 months. After 1 year sensing was 7.76±2.9 mV, threshold 1V/0.24±0.13 ms, Impedance (RC) was 480±66 Ohm and Impedance (shock) was 61±9 Ohm.
Conclusion The Sprint Fidelis lead allows a safe implantation in high septal position with stable and effective values after 1 year. Also defibrillation showed the same effectiveness as in apical position.

[31]
OPTIMIZED PROGRAMMING OF THE POSTVENTRICULAR ATRIAL BLANKING LEADS TO LOW INCIDENCE OF INAPPROPRIATE MODE SWITCH DUE TO FAR FIELD R-WAVE SENSING

W. KAINZ[1], M. GRUSKA[1], A. BEINHAUER[2], P. VOCK[2], A. HUEMMER[3], T. LEWALTER[4], PAFOS STUDY GROUP

[1]HANUSCHKRANKENHAUS, WIEN, AUSTRIA; [2]KRANKENHAUS, ST. POELTEN, AUSTRIA; [3]ST. JUDE MEDICAL, ESCHBORN, GERMANY; [4]UNIVERSITÄTSKLINIKUM, BONN, GERMANY

Background Correct detection of atrial arrhythmias (AT/AF) by implanted pacemakers is still a challenging issue in clinical practice and AF suppression trials. False positive mode switching, mainly due to far field R-wave sensing (FFS) leads to inappropriate loss of atrioventricular synchrony, can lead to pacemaker syndrome, and impairs the reliability of pacemaker Holter data. This analysis focuses on the outcome of a far field sensing test in terms of PVAB programming and incidence of FFS in the stored IEGMs of a dual chamber paced population enrolled in the PAFOS Trial.
Methods A total of 166 patients (71±8 years; 93 Females) with paroxysmal/persistent AF were analyzed. Indications were sinus node disease (n=112), atrioventricular block (n=11), binodal disease (n=32), other indications (n=1), not specified (n=10). At enrolment PVAB was optimised, defined as 25 ms longer than the shortest PVAB without provocation of inappropriate mode switch. Atrial sensitivity was set at 0.2 mV for the follow-up (FU). The stored IEGMs (12; each 12 sec. duration) were retrieved and analyzed at each FU.
Results Programmed PVAB was 120±26 (60-200) ms. 42% of patients required a PVAB longer than the nominal setting (100ms). In 11 patients no FFS test was possible due to AF or no intrinsic rhythm, 9 patients received a shorter than optimized PVAB. During FU (7.3±2.0 months; 0.6-11.5) 13 of 148 (8.8%) patients with documented IEGMs had at least one episode (6.6±4.5; 1-12) of inappropriate mode switch due to FFS in the stored IEGMS. Occurrence of FFS was associated with non optimized programming ($p<0.05$). 87 of 3513 stored IEGMs (2.5%) showed FFS. During FU PVAB was changed in 27/166 (16.3%) patients.
Conclusions Individual adjustment of the PVAB leads to low incidence of inappropriate mode switch due to FFS and allows the programming of high atrial sensitivity to enhance AF detection.

[32]
VENTRICULAR ARRHYTHMIAS IN CARDIAC PACING PATIENTS: MULTICENTRIC STUDY

M. HERO[1], M. GUENOUN[2]

[1]MEDTRONIC BOULOGNE, BILLANCOURT, FRANCE; [2]CLINQUE BOUCHARD, MARSEILLE, FRANCE

Background and aim Patients implanted with dual chamber (DC) pacemakers have frequent episodes of arrhythmia. The interest of memory functions (MF) featuring EGM recordings to recognize and characterize these arrhythmias, particularly at the ventricular level, is still not well evaluated. The goal of this study is to establish the pertinence of MF at the ventricular level by repeated analysis at follow-up of the data recorded in PM memories.
Methods and results A prospective series of 405 patients (76+/-10 yrs), M 59%, F 41% implanted for AVB (37%) and SD (50%) were seen at two post implant semestrial follow-ups, f/u1 at 6 months and f/u2 at 12 months. 83 pts (20%) at f/u1 + f/u2 showed ventricular tachycardias (VT) defined as at least 5 consecutive complexes at a frequency >175 bpm at 102 f/us (17%). 55 pts (14%) showed VT at f/u1, 47 (12%) at f/u2 and only 19 (5%) at both f/u1 and f/u2. VT occurrence was statistically independent from A and V cumulated percentage of pacing and atrial arrhythmia episodes. We relate below the average number of VT episodes and the average length and frequency of the longest episode at each f/u.

Follow-up	N° of episodes (min - MAX)	Length (min - MAX)	Frequency std. margin
f/u1:0-6 m	6 (1–83)	3 sec (1–41)	204+/-20 bpm
f/u2:6–12 m	8 (1–94)	4 sec (1–35	202+/-20 bpm

Conclusion In our series, VT is frequently observed in 20% at 6 and 12 months follows-up of pacing patients implanted for standard indications. 2/3 of these pts show arrhythmia from the first 6 months f/u and 1/4 of these pts at both 6 and 12 months f/u. 1 year of follow up seems to demonstrate best sensitivity for VT detection. MF featuring EGM recordings are a tool for reliable diagnostic and monitoring of these events. Further studies are required to evaluate the prognostic significance of these arrhythmias.

[33]
TEST REPETITION SIGNIFICANTLY INCREASE T WAVE ALTERNANS DIAGNOSTIC ACCURACY BY REDUCING INDETERMINATE RESULTS

S. SARZI BRAGA, R. VANINETTI, A. LAPORTA, D. BERTIPAGLIA, S. MASNAGHETTI, F. SANTORO, R. RAIMONDO, R. PEDRETTI

DEPARTMENT OF CARDIOLOGY, IRCCS FONDAZIONE SALVATORE MAUGERI, TRADATE, ITALY

Background T wave alternans (TWA) testing is useful to stratify risk of sudden death/arrhythmic events in patients (pts) with structural heart diseases, but it is limited by a substantial number (20-40%) of indeterminate results.
Aim. Verify whether immediate TWA testing repetition reduce indeterminate results, as previously suggested.
Methods Fourteen pts with dilated cardiomyopathy (8 ischemic, 6 idiopathic) and a first indeterminate TWA result repeated the test during the same session. Characteristics of the study population were: male 93%, mean age 66±7 yrs, LVEF 40±12%, NYHA 1 class 71%, optimal medical treatment (ACE-inhibitors 93%, β-blockers 78%). TWA test was classified as indeterminate for patients-related factors (failure to maintain HR between 105 and 110 beats/min for >=1 min, unsustained TWA, excessive ectopy during exercise) or for technical reasons (noisy recording or rapid rise in heart rate -HR- through the target exercise HR range of 105 to 110 beats/min).
Results The first TWA test was indeterminate for patients-related factors in 65% cases (failure to maintain HR: 3 pts; unsustained TWA: 3 pts; excessive ectopy: 3 pts) and for technical reasons in 35% cases (noise: 2 pts, rapid rise in HR: 3 pts). Test repetition turned the result into determinate in a significant fraction of patients (57%, 8 pts).

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Improved accuracy was mainly due to a significant reduction in the number of indeterminate results from 35% to 17% cases for technical reasons (noise: 1 pt). Patients-related reasons for indeterminate test were confirmed in most cases (failure to maintain HR: 3 pts; unsustained TWA: 1 pt; excessive ectopy: 1 pt).
Conclusions TWA test accuracy can be significantly improved by immediately repeating the test which allow a significant reduction of technically indeterminate tests. The reduction of indeterminate test can result in increased clinical accuracy in the definition of pts eligible for implantable defibrillator therapy.

[34]
MICROVOLT T WAVE ALTERNANS EVOLVES OVER TIME IN PATIENTS WITH LEFT VENTRICULAR DYSFUNCTION: A NEED FOR PERIODICAL RE-EVALUATION?

S. SARZI BRAGA, R. VANINETTI, D. BERTIPAGLIA, R. PEDRETTI

DEPARTMENT OF CARDIOLOGY, IRCCS FONDAZIONE SALVATORE MAUGERI, TRADATE, ITALY

Introduction Microvolt T wave alternans (MTWA) has been shown to predict sudden cardiac death and arrhythmic events in patients (pts) with congestive heart failure. No data are available about the long-term course of the test and on the duration of its prognostic power.
Methods A total of 25 pts with left ventricular dysfunction (LVEF <40%) with and without symptoms from congestive heart failure were enrolled. Clinical, echocardiographic, and TWA parameters were recorded at baseline and at follow-up.
Results Pts were characterized by prevalent (68%) non ischemic cardiomyopathy, LVEF 32±5%, NYHA class >=2 48%, predominantly male (92%), mean age 59±13 yrs. At baseline a normal MTWA test was documented in 12 pts (48%), an indeterminate result was collected in 7 pts (28%), and 6 pts (24%) tested MTWA positive. At follow-up (34±12 months), 14 pts (56%) confirmed MTWA results (7 negative: 58%; 2 indeterminate: 28%; 5 positive: 83%, respectively), whereas 11 (44%) changed MTWA results (2 negative to indeterminate, 3 negative to positive, 4 indeterminate to negative, 1 indeterminate to positive, 1 positive to negative). Only the patient who normalized MTWA (positive to negative test) showed a significant concomitant change in LVEF (34 to 55%). In all other groups neither NYHA class score nor LVEF correlated with MTWA changes.
Conclusions MTWA evolves over time in pts with moderate to severe left ventricular dysfunction and congestive heart failure. Pts with a positive initial test tended to confirm test results, suggesting a good long-term reproducibility of the test in this setting. Conversely, a significant fraction of pts with a negative test changed their MTWA profile independently of their evolution in LVEF, suggesting that the periodical repetition of MTWA test in these pts might provide valuable information to ameliorate clinical path towards patient's best treatment.

[35]
VENTRICULAR ARRHYTHMIAS RISK EVALUATION BY MTWA VS PROGRAMMED VENTRICULAR STIMULATION IN POST MI PATIENTS WITH PRESERVED EJECTION FRACTION AND NO VENTRICULAR ARRHYTHMIAS

S. PESCARIU, D. MAXIMOV, D. POPA, D. BRIE, A. IONAC, C. MORNOS, M. SLOVENSKI, D. DRAGULESCU, S. DRAGULESCU

INSTITUTE OF CARDIOVASCULAR DISEASE, TIMISORA, ROMANIA

Purpose The study purpose is to determine the feasibility of MTWA for ventricular arrhythmia risk evaluation in patients (pts) with complete interventional revascularization after myocardial infarction (MI), preserved LV Ejection Fraction (LVEF) and no prior malignant ventricular arrhythmias.
Methods Study population: 74 pts with LVEF >45% and no prior malignant ventricular arrhythmias underwent successfully interventional revascularization with stent implantation for acute or recent MI(1 or 2 coronary vessel disease). At 30 days after interventional revascularization all pts underwent MTWA exercise test (Heartwave system, Cambridge Heart Inc. 2000) followed by electrophysiological study with standard programmed ventricular stimulation-PVS (including 1 to 3 extrastimuli).
Results Seventy four pts (13 women, 18%), mean age 56+/-11 years and LVEF 59+/-13% were enrolled. In 16 pts (22%) were found positive MTWA test, 52 pts (70%) were with negative test and 6 pts (8%) had indeterminate test. At PVS positive response- sustained ventricular arrhythmias were induced in only 2 pts with previous positive MTWA (1 pt ventricular monomorphic tachycardia, 1 pt ventricular polymorphic tachycardia). They were implanted with an implantable cardioverter defibrillator. In 12 pts with negative response at PVS, 9 with previous positive MTWA and 3 pts with previous negative MTWA, was induced nonsustained (between 10-25 seconds) ventricular tachycardia. Two pts with positive MTVA refused the PVS. The sensitivity of MTWA test for ventricular arrhythmias was 90%, with 81% specificity. The positive predictive value of MTWA for ventricular arrhythmic events was 97% and the negative predictive value was 14.3%. The average follow-up was 14 months without major arrhythmic events for all pts, including the pts implanted with ICD.
Conclusions The MTWA test has a good positive predictive value for arrhythmic events in this kind of patients and can be used for risk stratification. We consider that in patients with positive MTWA further invasive evaluation, respectively PVS, is necessary.

[36]
SPECTRAL HEART RATE VARIABILITY AND MORTALITY IN 2-YEARS FOLLOW-UP AFTER ACUTE MYOCARDIAL INFARCTION

A. MUSIALIK-LYDKA, B. SREDNIAWA, S. JUREK, J. KOWALCZYK, J. STABRYLA-DESKA, P. JARSKI, Z. KALARUS

1ST DEPARTMENT OF CARDIOLOGY, SILESIAN CENTER FOR HEART DISEASES, MEDICAL UNIVERSITY OF SILESIA, ZABRZE, POLAND

Spectral heart rate variability (HRV) reflects autonomic balance in the heart. The dependence between spectral HRV and the death after acute myocardial infarction (AMI) has not been fully understood.
Purpose To compare day and night rhythm of spectral HRV between patients (pts) with AMI who died and who survived during two years of the follow-up.
Methods The study population consisted of 267 pts (71 F, 196 M; 60±11 years) with AMI, invasively treated on admission. There were 10 cases of the death in two years follow-up. Pts who died and survived did not differ with respect to ejection fraction (39±10 vs 43±8%; p=NS) assessed on 5th day of AMI.
In all pts digital Holter monitoring on 5th day of AMI was performed. Spectral analysis parameters in normalized units: LF, HF, LF/HF for: day and night periods were calculated.
Results LF and LF/HF was significantly greater and HF-n was significantly lower in day than in night in pts who survived (62.5±19.9 vs 58.2±19.3; 3.7±2.9 vs 2.8±2.8; 26.9±13.8 vs 34.2±15.1 respectively; all p<0.001). LF, HF, and LF/HF did not differ between day and night in pts who died (55.8±24.2 vs 54.4±26.9; 32.1±16.6 vs 34.4±18.8; 2.5±1.9 vs 2.8±2.1 respectively; all p=NS).
Conclusions Pts who died in two years of the follow-up after AMI are characterized by the absence of day and night rhythm of spectral heart rate variability assessed on 5th day of AMI. It can be prognostic factor of the death in long term follow-up after AMI.

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[37]
USEFULNESS OF DELTA QTI FOR LOCALIZATION OF STENOSIS IN SINGLE VESSEL DISEASE, AND DIFFERENCES OF QT INTERVAL AND QT DISPERSION BETWEEN NORMAL AND STABLE ANGINA PATIENTS

B. JUNG, B. LEE, H. KANG, B. LEE

FATIMA GENERAL HOSPITAL, DAEGU, SOUTH KOREA

The purposes of study were to assess the difference of time course changes of QTi and QTd during exercise test by comparing between healty normal and stable angina patients, and the delta QTi (ÄQTi) was tested about the ability to reflect the location of regional myocardial ischemia in single vessel disease.
110 subjects were included in present study, and composed of 32 normal and 78 patients who present more than 70% stenosis of at least one of any three coronary vessels. ÄQTi was measured at V5 and aVF lead, which were considered to reflect anterolateral and inferior left ventricular myocardial region respectively. We assumed that the individual electrode have a potential to detect the ischemia of juxtaposed regional myocardium.
In stable angina, QTi and QTd were significantly prolonged compared to those of normal (278±22.4 mSec vs 300±31.3 mSec, $p<0.05$). Futhermore among patient group, two or three vessel disease showed more prolonged QTi and QTd compared to those of single vessel disease (1VD; 291±27.8 mSec vs 2VD; 314±33.7 mSec vs 3VD; 321±26.9 mSec, $p<0.001$). During exercise test, the degree of difference of QTi and QTd prolongation was augmented with increasing workload.
ÄQTi of V5 lead was greater in subgroup with LAD lesion (121±40.5 mSec) than LCX and RCA subgroups (119±37.3 mSec and 103±26.6 mSec), and in RCA lesion subgroup ÄQTi of aVF lead tended to be higher compared to other subgroups (RCA; 133±16.3 mSec vs LAD; 121±39.2 mSec and LCX; 119±40.4 mSec).
Conclusively, in stable angina patients, QTi and QTd were significantly prolonged compared with those of normal, and augmented by exercise stress. Only QTi had a tendency to increase according to the number of vessels with stenosis around peak exercise. Futhermore, for addressing the location of regional ischemia in single vessel disease, ÄQTi's were considered to be useful method.

[38]
ELECTRICAL STORM IN LONG QT SYNDROME IN SPITE OF LEFT STELLATE GANGLIONECTOMY

J. VILLAFANE

CHILDREN'S HEART SPECIALISTS, LOUISVILLE, USA

Introduction Long QT Syndrome (LQTS) is a familial electrical disorder that may be associated with atypical syncope, sudden cardiac death (SCD) and Torsades de Pointes (TdP). Subjects with any of the above symptoms undergo implantation of an internal defibrillator (AICD). About 9% of LQTS subjects with AICD may develop electrical storms (ES). It has been suggested that surgical partial left stellate ganglionectomy may help avoid ES.
Case report Seven year old male with LQTS and positive genetic mutation compatible with LQT1 presents with recurrent electrical storms in spite of left stellate ganglionectomy. Subject was referred to our service at 6 months of age for cardiac electrophysiologic evaluation of an abnormally prolonged QT interval (corrected QT of 0.48 sec). He had no symptoms, but his mother had a malignant history of LQTS with recurrent atypical syncopal spells.
At 2 years of age he had at least 4 exertional syncopal spells. We confirmed lack of compliance with beta blockers and/or subtherapeutic drug levels on most of the SCD episodes. A prolonged QTc (0.58 sec) and T wave alternans was detected shortly after the second black out spell. Parents refused an AICD. Six months later, after two more episodes of SCD, the subject underwent AICD implantation and partial left stellate ganglionectomy. He had transitory Horner's syndrome. Ten months post-implantation he had ES with 91 AICD shocks. Potassium and beta-blocker serum levels were low. Since then, he has had 3 more ES while playing. Lack of compliance with beta blockers and/or subtherapeutic drug levels were confirmed in all 3 episodes.
Conclusions Recurrent ES may occur in spite of left stellate ganglionectomy. Compliance with beta blocker therapy, especially in LQT1, may help in preventing ES in subjects who have undergone left stellate ganglionectomy.

[39]
SELECTION OF TACHYARRHYTHMIA TREATMENT IN SMALL CHILDREN

L. SVINTSOVA, I. KOVALYOV, O. MURZINA, S. POPOV

INSTITUTION OF CARDILOGY, TOMSK, RUSSIA

Material and methods Tachyarrhythmia treatment results were analyzed in 55 children aged from 2 days to 5 years, including 27 patients aged to one year. Tachyarrhythmia was revealed for the first time in 9 (16.4%) children in antenatal period. Most tachyarrhythmias in this age were supraventricular ones (SVT) (n=52); only 3 children had ventricular tachycardias (VT). SVT consisted of paroxysmal tachycardias and constantly recurrent intraatrial ones (n=34). Twenty (36.3%) children including 14 ones aged to one year revealed their tachyarrhythmias after surgical correction of congenital heart disease. Tachycardias were complication of early postoperative period in 18 children having congenital heart disease.
SVT children were divided into three groups depending on treatment method used. The I group (n=26) were children who underwent drug treatment. The II group were 15 children who underwent 100% effective radiofrequency ablation (RFA) of tachycardia. Accessory pathways ablation was performed in 6 children, intraatrial tachycardia ablation was performed in 11 children. The III group (n=11) were children aged to one year having constant atrial tachycardia and atrial flutter who underwent 90% effective cardioversion. Cardioverters-defibrillators (ICD) were implanted in two children: one had idiopatic VT, the other revealed it in the setting of late congenital carditis. RFA of ectopic focus was performed in one patient who had runs of VT in the setting of rapid ventricular extrasystole from right ventricular output camera.
Conclusion Antiarrhythmic therapy (AAT) was refractive in 50% of cases. Combinations of antiarrhythmic drugs began to be more widely used to treat AAT in small children. Indications for RFA performing are beginning to broaden including patients aged to one year having drug refractive tachycardias. Cardioversion is method of choice to treat constant forms of SVT including in newborns. Experience of implantations ISD in newborns having VT is accumulating aimed at preventing sudden cardiac death.

[40]
RADIOFREQUENCY CATHETER ABLATION IN CHILDREN AND ADOLESCENT PERFORMED BY ADULT TRAINED ELECTROPHYSIOLOGY TEAM

P. PRUSZKOWSKA-SKRZEP[1], A. LENARCZYK[2], S. PLUTA[1], O. KOWALSKI[1], R. LENARCZYK[1], B. ZEIFERT[2], B. CHODOR[2], M. SZKUTNIK[2], J. BIALKOWSKI[2], Z. KALARUS[1]

[1]1ST DEPARTMENT OF CARDIOLOGY, SILESIAN CENTER OF HEART DISEASE, ZABRZE, POLAND; [2]DEPARTMENT OF CONGENITAL HEART DISEASE AND PEDIATRIC CARDIOLOGY, SILESIAN CENTER OF HEART DISEASE, ZABRZE, POLAND

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Background Radiofrequency catheter ablation (RFCA) has become the first-line therapy in children and adolescent with different types of symptomatic, drug-refractory arrhythmias. Invasive pediatric electrophysiology performed by adult-trained electrophysiology team encompasses different spectrum of conditions and challenges.
Aim of the study was to assess safety and efficacy of RFCA in children and adolescents performed by adult-trained electrophysiology team.
Methods Study population consisted of 107 consecutive symptomatic pediatric patients (pts) with drug-refractory tachyarrhythmias, mean age 15.3±3.02 years (56 boys-52.34%), who underwent catheter ablation in our center since January 2001 to June 2007. All RFCA were performed by electrophysiology team experienced in more than 1500 ablation-procedures in adult pts. Procedures were performed with local anesthesia and in light or deep sedation. Left heart was approached with the use of transseptal technique.
Results Atrio-ventricular reentrant tachycardia (AVRT) was diagnosed in 64 pts, success-rate in AVRT group was 92.19% (59 pts), recurrence-rate: 13.56% (8 pts), AV-node reentrant tachycardia was found in 21 pts, success-rate was 95.23% (20 pts) recurrences occurred in 1 pt (5%). In 13 pts ventricular tachycardia or ventricular ectopy was diagnosed, in 12 pts successful RFCA was performed (92.31%), recurrence occurred in 1 pt (8.33%). Ectopic atrial tachycardia (EAT) was found in 4 pts, typical atrial flutter (AFL) in 5. Success-rate and recurrence-rate were 100% and 0 in EAT pts respectively, 80% (4 pts) and 25% (1 pt) for AFL group. Serious complication occurred in one patient (0.9%). Overall success rate of RFCA was 92.52%, recurrence rate – 11.11%.
Conclusions Radiofrequency catheter ablation in children and adolescent performed by adult-trained electrophysiology team is a safe and efficient procedure.

[41]
NONINVASIVE LOCALIZATION OF THE REPOLARIZATION HETEROGENEITY AREAS AND THEIR RELATION TO ARRHYTHMOGENIC FOCUSES

M. SHKOLNIKOVA[1], L. KALININ[1], S. TERMOSESOV[1], I. POLYAKOVA[2]

[1]THE CHILDREN'S SCIENTIFIC-PRACTICAL CENTER OF ARRHYTHMIAS, INSTITUTE OF PEDIATRICS AND CHILDREN'S SURGERY, MOSCOW, RUSSIA; [2]BAKOULEV SCIENTIFIC CENTER FOR CARDIOVASCULAR SURGERY, MOSCOW, RUSSIA

The ventricular repolarization heterogeneity (VRH) can provide the substrate for reentrant ventricular arrhythmias (VA).
Purpose 1. To evaluate, is the repolarization heterogeneity manifesting in children with VA at the normal (sinus) rate; 2. To localize the arrhythmogenic focuses and areas of VRH by body surface potential mapping (BSPM).
Methods BSPM was carried out in 57 children with VA and structurally intact heart (age 8-17, 23 boys, 34 girls). 20 healthy children (age 5-17, 7 boys, 13 girls) were enrolled in control group. Cardiag System (Czech Republic) with ECG registration in 80 unipolar leads on the thorax surface and 12 standard leads was used for BSM.
Results Initial BSPM with ventricular extrasystole isopotential maps analyzes were turned to account for the noninvasive localization of anomalous activity. The site of anomalous activity origin was confirmed by successful ablation of arrhythmogenic focuses: 22 children with right, 19 - with left ventricular outflow tract arrhythmias; 13 - with arrhythmias from the antero-, mid- or posterobasal part of the IVS; 3 – with fascicular arrhythmia. Their focuses obtained by BSPM were compatible with invasive locations with 68-100% accuracy depending on the site. BSPM with sinus QRST isopotential and isointegral maps analyzes were turned to account for the revealing of anomalous repolarization. ST-T isopotential maps revealed distinctive signs in 63% of patients with VA; ST-T isointegral maps – in 56%; QRST isointegral maps – in 58%. The VRH areas at sinus rhythm and the arrhythmogenic focuses were agreed.
Conclusion 1. The 56-63% of children with VA and structurally intact heart exhibit at the normal (sinus) rhythm the signs of VRH in ectopic activity zones. 2. BSPM is the sensitive indicators of local myocardial electrical depolarization and repolarization abnormalities. It is helpful in topical diagnosis of VA in children.

[42]
THE LEVEL OF ANTICONDUCTING TISSUE ANTIBODIES IN CHILDREN WITH SICK SINUS SYNDROME

E. POLYAKOVA, M. SHKOLNIKOVA

RUSSIAN CENTER FOR CHILDREN ARRHYTHMIA, DEPARTMENT OF DIAGNOSTIC ARRHYTHMIAS, MOSCOW INSTITUTE PEDIATRICS AND CHILDREN SURGERY, MOSCOW, RUSSIA

The sick sinus syndrome (SSS) is being recognized at young ages with increasing frequency. When it is not connected with heart surgery or structural heart diseases, the exact etiology remains usually unknown. Now practically there are no data about immunological status of children with heart diseases, especially with cardiac arrhythmias.
The aim of research To analyze the contribution of immunological mechanisms in the pathophysiology of the SSS and sinus node dysfunction (SND) in children and adolescents without structural heart disease.
Clinical observations 51 children with SND at the age of 8-16 years old and 14 age- and sex matched healthy control children.
Methods Electrocardiography in 12 standard leads, 24-hours Holter monitoring, Treadmill exercise test, ECHO-CG, At all children immunological analysis on the anticonducting tissue antibodies (ACTA) was spent. Follow-up of study has made from 3 till 12 years (mean 5.2 years +3.6).
Results Circulating ACTA ≥1:80 are registered in 2 (14%) of healthy children and 80% of all patients with SDN ($p<0.01$) with relatively high incidence in children with SSS (89%, $p<0.05$). The high (≥1:160) level of ACTA are registered in 74% patients with SSS and 7% in control group ($p<0.001$). The very high (≥1:320) level of ACTA are registered in 37% patients with SSS ($P<0.05$). There is a ten-fold risk of SSS in patients with anticonducting tissue antibodies as compared to the age-matched controls. The high (100%) or very high (55%) level of ACTA are registered in 10 patients with severe bradycardia andor documented asystolic pauses of 3.0 to 32.0 s, who were indicated for pacemaker implantation.
Conclusions The level of ACTA correlates with degree of idiopathic SSS and diseases heaviness. Immunological factors can be one of the arrangements SSS developments in children.

[43]
RADIOFREQUENCY ABLATION OF ARRHYTHMIAS IN INFANTS AND CHILDREN IN DEVELOPING COUNTRIES: TIME TO GET AGGRESSIVE?

N. NAIK, R. JUNEJA, R. YADAV, R. THANGJAM, A. SAXENA, S. KOTHARI, K. TALWAR

ALL INDIA INSTITUTE OF MEDICAL SCIENCES, NEW DELHI, INDIA

Background Management of infants and young children with recurrent tachyarrhythmias is difficult in developing countries like India due to iliteracy, poor access to medical care and lack of pediatric cardiac specialists.
Methods and results We analyzed our data of 68 patients in whom RF ablation was done for SVT and fascicular VT between Jan 2001 to June 2007. The electrophysiology team consisted of one pediatric

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cardiologist (also trained in electrophysiology) with 4 adult electrophysiologists. Their age ranged from 9 months to 14 years, of whom 12 patients weighed less than 15 kgs and another 10 children between ages of 5-8 years weighed less than 25 kg. The procedure was performed in conscious sedation in 43 patients and under general anesthesia in 25. The tachycardia mechanism was AVNRT in 14, AVRT in 24, EAT in 10 (left atrial in 4), Mahaim fibre mediated tachycardia in 5, IART in 6 and ILVT in another 6 patients. No tachycardia was inducible in 3 patients without a manifest pathway and ablation was not attempted. Underlying structural heart disease was present in 15 patients (Ebstein's anomaly in 6, transposition of great arteries in 4 and post-op for congenital heart disease in 5). Electroanantomic mapping was done in 9 patients - all others were mapped conventionally. Procedural success was obtained in 62/68 patients with no major complications. Septal puncture was performed in 5 patients to gain access to left atrium. Over a follow-up of 20±14 months, 7 patients had recurrence of the tachycardia of whom 5 underwent a repeat procedure. Immediate results or complications were not different in children who weighed less than 20 kg.
Conclusions RFA in children can be performed by pediatric and adult electrophysiologists in developing countries with good short and long-term success rates and low complication rates.

[44]
DAILY AND NIGHTLY HEART RATE VARIABILITY IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION AND SUDDEN CARDIAC DEATH

A. BOSKOVIC, L. MUSIC

CC OF MONTENEGRO, PODGORICA, MONTENEGRO

Heart rate variability (HRV) as marker of activity of autonomic nerve system can be used as noninvasive method for risk stratification in patients with acute myocardial infarction(AMI).
Aim The aim of the study is to estimate if there is a difference between daily and nightly HRV in risk stratification for sudden cardiac death in patients with AMI.
Methods and results We observed 100 patients with AMI, mean age 56.99±11.03, M/F was 80/20. Anterior localization of AMI had 44 patients and inferior AMI had 56. Time domain HRV analysis, was obtained by mean of a 24-hour Holter monitoring, and the parameters calculated were: standard deviation of all NN intervals (SDNN) and standard deviation of 6-hours NN intervals daily(SDNNd) and nightly(SDNNn). We also observed the clinical, laboratory and echocardiography variables. During follow-up period of one year 6 patients had sudden cardiac death. There was significant lower value of SDNN 59.33±12.64 ms in dead vs 98.38±28.21 ms in survivors, mean daily SDNNd was 47.50±13.82 ms in dead vs 78.72±25.41 ms in survivors ($p<0,01$), mean nightly SDNNn was 58.67±17.86 ms in dead and 101.16±43.37 ms in survivors ($p<0,01$). Ventricular ectopic activity is more frequent in patients who died suddenly than in the survivors ($p<0.01$). Multivariate Cox analysis showed that only mean heart rate during 24-hour Holter monitoring and ventricular ectopic activity (number of VPCs >10/hour) are significant, independent predictors for sudden cardiac death in post-MI patients ($p<0.01$), but not daily SDNN, nightly SDNN and 24-hour SDNN.
Conclusion Daily HRV and nightly HRV were lower in patients who died suddenly than in survivors, but they are not independent predictors for sudden cardiac death in post-MI patients.

[45]
NITRIC OXIDE METABOLITES IN PATIENTS WITH VASOVAGAL SYNCOPE

G. RUIZ[1], S. SINIGAGLIA[1], R. CHIRIFE[1], M. CAPULA[1], R. HERMES[1], M. TENTORI[1], H. GRANCELLI[2], M. NOGUES[2]

[1]HOSPITAL JUAN A. FERNANDEZ, BUENOS AIRES, ARGENTINA; [2]INSTITUTO FLENI, BUENOS AIRES, ARGENTINA

Nitric oxide formed in the vascular endothelium produces, among other effects, a strong vasodilation. It contributes to the hypotension observed in different pathological models. In order to evaluate the role of nitric oxyde in hypotension induced by head-up tilt test (HUT) we measured the plasma levels of its metabolites, nitrites and nitrates (NOx), during the test.
Twelve patients with vasovagal syncope and HUT (+) (mean age: 23±5 years, 9 women) and 13 healthy volunteers with HUT (-) (mean age: 24±5, 11 women) were included. The venous blood samples were obtained under baseline conditions in supine position (T0), at the end of the HUT (45 minutes for the HUT(-) and haemodynamic decompensation for HUT (+) patients (T1)), and 15 minutes after the end of the HUT (T2). Routine biochemistry and haemodynamic parameters during the test were computed in all subjects.
Results The NOx plasma values (umol/l) were the following: HUT (+) pts: T0: 5.7±1.6, T1: 6.1±3.2, T2: 6.1±3; ANOVA, repeated measures=p: ns Controls: T0: 8.8±4.7, T1: 8.5±3.6, T2: 10.2±8.9, ANOVA, repeated measures=p: ns. T0 HUT (+) pts versus T0 Controls= p:0.05 The NOx levels were directly correlated with the baseline diastolic blood pressure (R Spearman=0.52, p=0.007).
Conclusions The baseline plasma levels of NOx are significantly lower in patients with HUT (+) than in controls. Hypothetically, this could be related to a better signal transduction NO-cGMP. The plasma measurement of NOx during HUT doesn´t allow us to confirm a role of NO on hypotension during vasovagal syncope.

[46]
ELECTROPHYSIOLOGICAL PROPERTIES OF PULMONARY VEINS IN PATIENTS WITH PAROXYSMAL ATRIAL FIBRILLATION AND THEIR RELATION WITH MORPHOLOGICAL FINDINGS

A. REVISHVILI[1], G. IMNADZE[2]

[1]A.N. BAKOULEV CENTER FOR CARDIOVASCULAR SURGERY, MOSCOW, RUSSIA; [2]TBILISI STATE MEDICAL UNIVERSITY, TBILISI, GEORGIA

Purpose In spite of impressive progress in pulmonary vein catheter ablation, electrophysiological properties and morphology of pulmonary veins (PV) of patients with Atrial Fibrillation (AF) still make interest.
Methods Research included 30 patients with paroxysmal AF. By using the programming stimulation of left atrium (LA) and PV, criteria of arrhythmogenicity of PVs were investigated.We divided all arrhythmogenicity criteria into two groups. The first group represented pre-stimulation criteria and the second one was stimulation criteria. Moreover, effective and functional refractory periods (ERP, FRP) of PV and LA were compared.The research also included twenty human autopsy hearts: 10 with cardio-vascular disease and 10 without cardio-vascular disease.
Results Electrophysiological investigation achieved that aforementioned arrhythmogenicity criteria exist in 67% of patients. 24 PVs were arrhythmogenic. Pre-stimulation arrhythmogenicity criteria were found in 86% of arrhythmogenic PVs (Disorder of impulse conduction in PV and LA was presented in 20%, ectopic beats from PV – in 22%, bursts – in 27% and spontaneous or mechanical origin of AF episodes – in 17%). Stimulation arrhythmogenicity criteria were found in 53.5% of arrhythmogenic PVs (PV echo during the pro-

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gramming stimulation – in 40% and arrhythmia during stimulation – in 13.5%). The ERP and FRP of arrhythmogenic PV were significantly shorter then ERP and FRP of the LA. ($p<0.00001$, $p<0.0006$). Morphological analysis of PV and myocardial sleeves indicated the following: In PV muscle sleeves of patients with atrial fibrillation the local changes like lymphocyte infiltration and fibrosis were found. Moreover in two patients we have also found fibro-lyphomathosis reminiscent picture of arrhythmogenic displasia in right ventricle.
Conclusion The electrophysiological findings in myocardial sleeves of PV can cause atrial fibrillation by means of trigger activity and/or re-entry mechanism. Morphological investigation confirmed that changes in muscular sleeves of pulmonary veins make suitable substrate for arrhythmias with aforementioned mechanisms.

[47]
ELECTROPHYSIOLOGICAL VARIABLES OF THE HEART AFTER CARDIOPULMONARY BYPASS SURGERY WITH VARIOUS ARRHYTHMIAS IN THE PAST

L. BOCKERIA, O. BOCKERIA, V. BAZAEV, A. GRITSAI, A. FILATOV

A.N.BAKULEV RESEARCH CENTRE OF CARDIOVASCULAR SURGERY, MOSCOW, RUSSIA

Purpose of study To study electrophysiological variables in intraoperative and early postoperative periods with various arrhythmias in the past in patients with heart diseases.
Methods All the pts (124) underwent cardiopulmonary bypass (CPB) surgery, had sinus rhythm before surgery and electrophysiological variables were studied in pre- and early postoperative period. 93 pts (75.3%) had no atrial fibrillation (AF) in the past (group A), 31 pts (24.7%) (group B) experienced paroxysms of AF before operation (10 pts had CHD, 9 – acquired valve diseases, 11 – CHD+valve diseases) and 1 – congenital heart disease). 9 pts from group B had been previously treated by amiodarone. Electrophysiological variables analyzed on 1, 3 and 5 day after surgery.
Results 32 (25.8%) of 124 pts had paroxysms of AF in postoperative period: 11 were from group A (8.9%) and 21 (16.9%) from group B. 3 (33.3%) of 9 pts who were treated with amiodarone before the operation had recurrent AF. 7 of 9 pts (63.6%) from group A who developed paroxysms of AF in postoperative period had cardiopulmonary bypass duration for more than 150 minutes. 24 of 32 pts (75%) with paroxysms of AF in postoperative period had atrial refractory period <200 ms, 12 (37.5%) pts had dispersion of refractory period >50 ms. Maximal decrease of effective refractory period (ERP) were observed on 2-3 day after operation.
Conclusions Several predictors of AF paroxysms in early postoperative period were found. Electrophysiological predictors of AF in postoperative period were atrial ERP less than 200 ms and dispersion of refractory period more than 50 ms. "Vulnerable" period in means of recurrence of AF happened on 2^{nd}-3^{rd} post operative days. Preventive antiarrhythmic treatment should be indicated to patients with recurrent AF before surgery. Risk of AF paroxysm correlated with duration of CPB (more than 150 minutes).

[48]
THE IMPACT ON QUALITY OF LIFE OF THE RADIOFREQUENCY MINI-MAZE PROCEDURE COMBINED WITH MITRAL VALVE SURGERY: COMPARISON WITH TWO MATCHED CONTROL GROUPS

G. LUZI, P. LILLA DELLA MONICA, A. MONTALTO, G. CASALI, C. D'ALESSANDRO, V. POLIZZI, F. SBARAGLIA, F. MUSUMECI

DEPARTMENT OF CARDIAC SURGERY, SAN CAMILLO HOSPITAL, ROME, ITALY

Purpose This study is aimed to evaluate the impact on quality of life of the radiofrequency mini-maze procedure, in patients with chronic atrial fibrillation (AF) underwent to mitral valve surgery.
Materials and methods Between November 2002 and June 2004, 40 patients with AF were underwent to the mini-maze procedure combined with mitral valve surgery (mini-maze group or MMG).They were compared with 2 groups of patients matched for age, sex, left ventricular function and associated risk factors. One hundred and eight patients underwent to isolated mitral surgery in the same period and not affected by preoperative chronic AF (valve group or VG), and 52 consecutive patients with atrial fibrillation operated on isolated mitral surgery before the introduction in our Institution of the mini-maze procedure (AF group or AFG). The test SF-36 was utilized to estimate the perceived quality of life in the three groups.
Results Hospital mortality was 5% (2 pts) in the MG and 4.6% (5 pts) in the VG and 5.5% (3pts) in the AFG (p=NS).Three-year survival was 92.5%±0.042 in the MG, 93.2%±0.037 in the VG and 91.3%±0.055 in AFG (p=NS).At the follow-up 77.8% of the patients in the MG was in sinus rhythm, while 16.7% presented AF, and one patient required permanent pacemaker.The scores obtained with the test Sf-36 were similar in the MMG and VG, while they were significantly higher than AFG in all domains of the test.
Conclusions Our retrospective study shows that mini-maze procedure improve the perceived quality of life in patients with preoperative AF underwent to mitral surgery.

[49]
SEVEN YEAR EXPERIENCE WITH INTERVENTIONAL TREATMENT OF DIFFERENT FORMS OF ATRIAL FIBRILLATION

A. REVISHVILI, F. RZAEV, E. LUBKINA, S. ALEKSANDROVA, E. LABARTKAVA, O. SOPOV, R. REKVAVA

A.N. BAKOULEV CENTER FOR CARDIOVASCULAR SURGERY, MOSCOW, RUSSIA

Purpose Evaluation of long-term clinical results of electrophysiological and electroanatomical approaches of interventional treatment in patients with different forms of atrial fibrillation (AF) and ectopic atrial tachycardias (AT).
Material and methods From january 2000 to june 2007, in the Department of Tachyarrhythmias of the Bakoulev Center, we applied interventional methods of treatment in 467 patients (358 men and 109 women) with different forms of AF and ectopic AT. Among these patients 207 had paroxysmal AF, 38 – ectopic AT originating from the PV, 113 – persistent AF and 69 – continuous form of AF. We have performed 628 RFA procedures (on the average 1.34 per 1 patient). Mean age of patients was 45.3±12.0 years (9 – 71 years), with arrhythmia duration from 1 to 29 years. Antiarrhythmic drugs (AAD), including the agents of IC and III classes, proved ineffective in all patients. In most of cases we performed electrophysiological approach of the interventional treatment, directed to the segmental ostial disconnection of PV from the LA. In 200 (42.8%) patients an additional RFA was performed at the cavotricuspid isthmus. Electroanatomical approach using CARTO system was carried out in 65 patients with continuous or persistent form of AF (on the average – 1.1 procedure per 1 patient).
Results With follow-up period over 1 year total effectiveness was 87.2%. 5 (1.1%) patients with ineffective procedure and severe clinical course of arrhythmia underwent RFA of His bundle with the implantation of rate-adaptive pacemaker.

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[50]
EVALUATION OF RELATIONSHIP BETWEEN LEFT VENTRICULAR DIASTOLIC FUNCTION AND ABNORMAL REPOLARIZATION AFTER RADIOFREQUENCY CATHETER ABLATION IN PATIENTS WITH WOLFF-PARKINSON

K. WENG, C. CHIOU, C. LIN, K. HSIEH

KAOHSIUNG VETERANS GENERAL HOSPITAL, KAOHSIUNG, TAIWAN

Purpose The aim of the study is to assess the serial changes in LV function after RF ablation of a manifest accessory pathway and the relationship between T-wave changes and LV diastolic function.
Methods The subjects consisted of three groups with tachyarrhythmias. Group A (n=20) included patients with manifest WPW syndrome. Group B (n=20) included patients with concealed WPW syndrome. Group C (n=20) included patients with AVNRT. All patients underwent a series of EKG and echocardiographic examination before and after the catheter ablation procedure.
Results In group A (12±3 years), isolated right-sided ablation was performed in 7 patients and isolated left-sided ablation in 13 patients. In group B (13±2 years), isolated right-sided ablation was performed in 12 patients and isolated left-sided ablation in 8 patients. In group C (11±5 years), modification of slow pathway was performed in 20 patients. In group A, 13 patients had T-wave changes after ablation. In group B and C, none had T-wave changes after ablation. In three groups, there were no significant changes in LVDD, LVSD, and EF before and after ablation. The cE/A ratio decreased 1 day after ablation and improved after 1 month. The cDT increased 1 day to 1 week after ablation and decreased 1 month after ablation. LV cIVRT increased early after ablation and improved later. There were significant changes in the tissue Doppler parameters obtained from the LV septum. There was no correlation between the presence of T-wave changes and postablation echocardiographic findings.
Conclusions T-wave change after RF ablation of manifest accessory pathway may result from abrupt alteration of the sequence of ventricular repolarization and are not a direct result of RF ablation. This conclusion is supported by no correlation between the presence of T-wave changes and postablation echocardiographic findings.

[51]
COMMUNICATION DEVICES PRODUCE ELECTROMAGNETIC INTERFERENCE ON ECG MACHINES: DOES IT REALLY MATTER?

A. BARANCHUK, J. KANG, C. SHAW, D. CAMPBELL, H. ALANAZI, W. HOPMAN, D. REDFEARN, C. SIMPSON

QUEEN'S UNIVERSITY, KINGSTON, CANADA

Background Use of communication devices in the hospital environment remains controversial. Electromagnetic interference (EMI) can affect different medical devices. Potential sources for EMI on ECG machines were systematically tested.
Aims: To determine the presence of EMI on ECG machines produced by different communication devices. To evaluate the clinical impact of EMI on ECG interpretation.
Methods The communication devices tested were: A Global System for Mobile communication (GSM) receiver, a Code Division Multiple Access (CDMA), an analog phone, a wireless local area network and an alpha-numeric pager. EMI was tested on three ECG machines: MAC 5000, MAC 1200 and ELI 100.
An isolated room without metallic objects and no operating electrical devices was used as the test site. The devices were tested at 2 and 1 meter, 50, 25 and 0 cm from the ECG acquisition module. ECGs were obtained when communication devices were active and inactive to determine EMI. Two blinded investigators analyzed the ECGs for EMI.
The ECGs were presented to a heterogeneous group of clinical providers (med students, residents, nurses, industry representatives and attendings) to evaluate the impact of EMI on ECG interpretation skills.
Results EMI was detected on the MAC 5000 ECG machine when activated GSM, CDMA and analog phones where placed on top of the acquisition module receiving an external call (see Figure). No EMI was seen on the other ECG machines or when the phones were at a longer distance or deactivated.
EMI was incorrectly diagnosed in 41.8% of the cases. EMI was confused most frequently with atrial fibrillation or flutter (16%) and pacemaker dysfunction (12%). Medical students (P<0.001) and non-cardiology residents (p=0.05) demonstrated significantly worse performance on EMI interpretation.
Conclusions Digital and analog phones produce EMI on modern ECG machines when activated in close proximity to the acquisition module. EMI impairs ECG interpretation.

[52]
ALGORITM OF TOPICAL ECG DIAGNOSTICS FOR RIGHT VENTRICULAR ARRHYTMYAS

A. REVISHVILI, R. SNEGUR

A.N. BAKOULEV CENTER FOR CARDIOVASCULAR SURGERY, MOSCOW, RUSSIA

Purpose of study Development of an algorithm of topical diagnostics for right ventricular arrhythmias.
Material and methods In 1998-2007, 202 patients with RV arrhythmias underwent RFA. In 176 patients the arrhythmogenous focus was located in the outflow tract, in 21 patients – in the inflow tract, and in 5 patients – in the trabecular portion. In order to develop an algorithm we have analyzed the ECG criteria: the electrical axis of arrhythmia and average pooled value of the amplitudes of arrhythmic complexes have been determined. The obtained data were compared with the locations found during invasive electrophysiological study and areas of effective RFA. Before and after ablation, pacing RV mapping with the Carto system (Biosense Webster) was carried out.
Results The algorithm contains three steps. During the Step 1 the RV was divided into basal, middle and apical portions. We decided to use ECG criteria of arryhtmic complexes in leads III and V5 for the differentiation of these portions. Step 2 consisted in the determination of the anterior, posterior and inferior RV walls in RAO 30°. Topical diagnostics of these walls was based on ECG criteria of arrhythmic complexes in leads I, III, aVF and aVL. The Step 3 was based on the determination of these wall in the left oblique view 45°. At this step we used ECG criteria of ventricular arrhythmias from the leads I, II, aVR and V2, V5. We used the criterion of determination of QRS width in lead III for the development of our algorithm. QRS >130 msec. was found typical for the arrhythmias originating from the lateral wall, while QRS <130 msec. – for septal location.
Conclusions We developed an algorithm allowing to determine the location of an arrhythmogenous focus with up to 97% diagnostic accuracy.

[53]
FAMILIAL CLUSTERING OF ATRIAL FLUTTER IN AN ITALIAN FAMILY: A HERITABLE SUSCEPTIBILITY OR CHANCE OCCURRENCE?

A. MONTENERO[1], P. ANDREW[2], V. NOVELLI[1], G. CONDORELLI[1], A. PUCA[1]

[1]IRCCS MULTIMEDICA, MILAN, ITALY; [2]ATLAS MEDICAL RESEARCH, INC, EDMONTON, CANADA

Background A genetic etiology for cardiac conduction disorders like atrial flutter (AFL) may exist in certain patients. This can be observed

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in clinical practice through the familial clustering of this cardiac arrhythmia.
Case presentation We describe an Italian family in which three brothers with AFL were identified. A four generation pedigree for this family, housing 45 subjects (24 men and 21 women), was constructed. Where possible, a brief medical history was obtained for each subject. A total of 6 subjects with a confirmed diagnosis of AFL were identified within the 3rd and 4th generation of the pedigree. Other cardiac arrhythmias, namely Wolff-Parkinson-White syndrome and atrial fibrillation, as well as sudden cardiac death were also identified. If a major assumption is made that the 45 members of our pedigree are independent individuals who were randomly selected from the general population, the observed incidence of AFL among these 45 individuals is significantly different from the reported chance incidence of AFL determined in a general population older than 80 years old (0.13 vs 0.00587; at a probability level <0.00001; Granada et al., 2000).
Conclusion Although the etiology of AFL is multifactorial, familial clustering suggests a heritable susceptibility for this common cardiac arrhythmia in certain patients. Identification of such affected families may enable linkage analysis to be performed for the determination of the genes involved.

[54]
REAL TIME MONITORING OF TIP ELECTRODE-TISSUE ORIENTATION AND CONTACT FORCE: OPTIMIZING ACCURACY AND SAFETY OF MAPPING AND ABLATION PROCEDURES

L. DI BIASE, M. ARRUDA, L. ARMAGANIJAN, D. PATEL, M. EL HALLAGE, M. KANJ, O. WAZNI, T. DRESING, J. CUMMINGS, M. BHARGAVA, J. BURKHARDT, D. MARTIN, W. SALIBA, R. SCHWEIKERT, A. NATALE

SECTION OF CARDIAC ELECTROPHYSIOLOGY AND PACING, DEPARTMENT OF CARDIOVASCULAR MEDICINE, THE CLEVELAND CLINIC FOUNDATION, CLEVELAND, USA

Background The accuracy and safety of mapping and ablation procedures depend on tip electrode contact which can be improved by applying force against the tissue.
Purposes To evaluate the feasibility and safety of using an open irrigation (OIC) ablation catheter guided by continuous real time monitoring of electrode tip-tissue interface contact force and orientation.
Methods and results An "in vivo" closed chest canine model was used to assess electrode tip-tissue contact and to correlate real time applied force with EGM amplitude and RF lesion size. The study system (Endosense) consists of an OIC with optical sensors and a continuous display showing force (axial and lateral) and tip orientation (perpendicular and parallel). Continuous force feedback allows the operator to optimize force maintain adequate catheter tip-tissue interface contact. When blinded to the force display, the operator consistently applies higher forces in the ventricles compared to the atria. There was no significant EGM changes with applied forces and no perforation up to 50 g in the atria and 80 g in the ventricles. Whereas a strong correlation between contact force and RF lesion size at smooth myocardium has been shown, this relationship was not confirmed at trabeculated ventricular sites where large lesions, associated with "pops" were created despite low force (5 g) at 45 W (15 ml/min irrigation). A non-audible pop was detected by the force sensor and confirmed on gross and microscopic examination. Esophageal thermal injury occurred with 20 g pressure delivered at 35 W for 30 secs to the LA directly opposite to an esophageal probe.
Conclusions This technology allows real time force and tip orientation monitoring. The sensor feedback optimizes electrode tip contact and may favorably impact the accuracy and safety of mapping and ablation procedures using conventional catheter manipulation and more importantly for remote navigation systems.

[55]
GOLDART – GOLD-ALLOY VS PLATINUM-IRIDIUM ELECTRODE FOR ABLATION OF AVNRT

M. STUEHLINGER[1], R. HOFMANN[2], F. SCHNOELL[3], S. WINTER[4], A. PODCZEK-SCHWEIGHOFER[5], S. WURTZ[6], F. HINTRINGER[1]

[1]DEPARTMENT OF CARDIOLOGY, MEDICAL UNIVERSITY, INNSBRUCK, AUSTRIA; [2]GENERAL HOSPITAL OF LINZ, LINZ, AUSTRIA; [3]REHABILITATIONSZENTRUM GROSSGMAIN, GROSSGMAIN, AUSTRIA; [4]KRANKENHAUS DER ELISABETHINEN, LINZ, AUSTRIA; [5]SMZ SUED, VIENNA, AUSTRIA; [6]BIOTRONIK GMBH, BERLIN, GERMANY

Purpose Radiofrequency (RF) catheter ablation targeting the slow pathway is currently the most effective treatment for patients with atrioventricular nodal reciprocating tachycardia (AVNRT). Gold exhibits a nearly 4 times greater thermal conductivity than platinum and the creation of deeper lesions was demonstrated in ex vivo animal experiments. The current clinical trial was initiated to compare gold catheters with standard platinum-iridium (Pt-Ir) material and to analyze differences in rising temperature or power during RF ablation in vivo.
Methods A prospective, randomized, blinded multicenter study design was used to compare catheters with a standard Pt-Ir tip and those with a gold alloy tip during ablation of the slow pathway in patients with AVNRT. The primary endpoint of the study was the mean increase of power until reaching 95% of maximum. The secondary endpoints were a number of other power output parameters and possible side effects of the procedure.
Results Although there was a trend towards higher power delivery in the gold group [4.96 (3.47-7.61) vs 4.28 (3.43-7.22) in Pt-Ir], this trend was not statistically significant. Likewise cumulative duration of all RF ablations, the total procedure time and the mean and maximum power delivered at all the other time points were not significantly different between the groups. Also the occurrence of permanent or transient AV-block and sensations of pain were similar in both treatment groups. However, clotting on the catheter tip after the intervention was observed more frequently in the Pt-Ir group.
Conclusion Power delivery cannot be significantly increased by ablation with gold electrodes. But the material seems to be safe and well tolerated and specifically did not increase the risk of AV-block. The significant reduction of coagulum formation on gold tips suggests a possible advantage of this material beyond its better conduction properties.

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[01]
THE CLINICAL SIGNIFICANCE OF UPPER THORACIC VEINS' IMAGING

M. YAHALOM[1,2], A. KRIVILEVICH[1], P. SORIN[1], J. SINGER-JORDAN[1], N. LOBERANT[1,2], N. ROGUIN[1,2]

[1]WESTERN GALILEE HOSPITAL, NAHARIYA, ISRAEL; [2]TECHNION – ITT, HAIFA, ISRAEL

Purpose The endocardial approach in permanent pacemaker or defibrillator implantation has been commonly used in the last two generations. Obstruction or stenosis of the great thoracic veins is a common feature in elderly patients (pts). This is true especially following chest procedures and major interventions like CABG, shunt for hemodialysis or following radiation therapy. This is also true for Behcet's disease and other thrombophilic tendencies.
Since early imaging of the upper thoracic veins is widely available and easy to perform we have decided to evaluate our patients prior to pacemaker/defibrillator implantation.
Materials and Methods Thirty-six (36) consecutive pts (16 Male, 20 Female), who required a new pacemaker (33) or defibrillator (3) Implantation, between July 2006 – October 2006 at the ages of 21-90 years (mean 77) were investigated. All 36 patients underwent radiopaque venography of the upper thoracic veins.
Results In two pts (6%) – bilateral obstruction or severe stenosis (diameter less then 1mm) were demonstrated by venography, in the upper thoracic veins. Those pts required an epicardial pacemaker.
In 4 pts (11%) a right-sided (instead of our common left-sided) approach – was needed, due to an old obstruction of the left Subclavian vein.
Conclusions We suggest that it is safe to perform a routine venography prior to pacemaker or defibrillator implantaion, to exlude any obstruction of the upper thoracic veins' system, in order to prevent failure of the implantaion.

[02]
LOCALIZATION OF ANOMALOUS VENTRICULAR DEPOLARIZATION BY BODY SURFACE POTENTIAL MAPPING AND BY MAGNETOCARDIOGRAPHY. FIRST EXPERIENCE IN THE CLINICAL USE OF SQUID-MAGNETOME

L. BOCKERIA[1], E. GOLUKHOVA[2], M. KRUGLOVA[3], I. POLYAKOVA[4]

[1]BAKOULEV SCIENTIFIC CENTER FOR CARDIOVASCULAR SURGERY, MOSCOW, RUSSIA; [2]BAKOULEV SCIENTIFIC CENTER FOR CARDIOVASCULAR SURGERY, MOSCOW, RUSSIA; [3]BAKOULEV SCIENTIFIC CENTER FOR CARDIOVASCULAR SURGERY, MOSCOW, RUSSIA; [4]BAKOULEV SCIENTIFIC CENTER FOR CARDIOVASCULAR SURGERY, MOSCOW, RUSSIA

Generally accepted the body surface potential mapping (BSPM) with the electrilc potential distribution analysis could be helpful in topical diagnosis of arrhythmias. The significance of extracardiac magnetic field measuring or magnetocardiography (MCG) is obscure for the present.
Purpose To evaluate the applicability of multichannel magnetometer for clinical investigation in patients with some arrhythmias. The MCG was recorded over the anterior chest wall of patients with a 7-channel SQUID -magnetometer in an unshielded room. Magnetic field characteristics corresponding to the initial QRS force were obtained for 34 patients with some cardiac arrhythmias associated with ventricular pre-excitation or ischaemic heart disease and 15 healthy subjects.
Conclusion MCG seems to become very promising non-invasive technique for localizing of arrhythmogenic structures. However, this method have to be refined, improved and validated by further systematical studies.

[03]
DOES THE PREVIOUS MYOCARDIAL INFARCTION INFLUENCE CARDIAC AUTONOMIC ACTIVITY ASSESSED BY THE NEW TIME DOMAIN PARAMETERS DALTON MABB AND DALTON SD?

A. MARKIEWICZ-GROCHOWALSKA[1], A. JANOWSKA-KULINSKA[1], K. TORZYNSKA[1], B. WIECKOWSKA[2], O. JERZYKOWSKA[3], M. MAJEWSKI[3], L. KRAMER[2], J. MOCZKO[2], T. SIMINIAK[4]

[1]CARDIOLOGY WARD OF DISTRICT HOSPITAL, POZNAN, POLAND; [2]CHAIR AND DEPARTMENT OF COMPUTER SCIENCES AND STATISTICS, POZNAN UNIVERSITY OF MEDICAL SCIENCES, POZNAN, POLAND; [3]J. STRUS MUNICIPAL HOSPITAL, POZNAN, POLAND; [4]POZNAN UNIVERSITY OF MEDICAL SCIENCES, POZNAN, POLAND

Introduction It is well known that diabetes and coronary artery disease decrease the HRV(heart rate variability), measured by standard time and frequency domain parameters.Novel mathematical models are created to optimize the assessment of the autonomic nervous system by evaluation of HRV.
Aim of the study The purpose of the study was to estimate the influence of previous myocardial infarction on HRV, using the new mathematical model, the Dalton MABB , Dalton SD and the standard time domain parameter SDNN.
Materials 433 patients without diabetes scheduled for coronary angiography were divided into two groups: MI group, consisted of patients with history of myocardial infarction (198 patients, 141 males and 57 females,mean age 60.75±10.19) and WMI group ,included persons without history of myocardial infarction (235 patients , 146 males and 89 females, mean age 58.63±9.75).
Methods A five minute digital electrocardiography signal was recorded on each patient. ECG signals were analyzed using virtual instrumentation technique based on LabView. The new time domain parameter of HRV, the Dalton SD (long term variability index) and Dalton MABB (short term variability index) and the standard time domain parameter SDNN were measured. Statistical data analysis consist of Mann-Whitney test.
Results There were significant statistical difference between MI and WMI groups in the Dalton MABB for MI: 12.91±17.61 vs WMI-20.59±31.17, p=0.019, Dalton SD for MI 36.37±29.67 vs WMI 53.07±57.40, p=0.023,SDNN for MI 25.56±31.64 vs WMI 33.95±40.72, p=0.046.
Comments The influence of myocardial infarction history on long and short term heart rate variability evaluated by Dalton SD and Dalton MABB factors together with standard parameter SDNN was observed.

[04]
FITNESS OF DRIVING MOTOR VEHICLES AFTER CARDIOVASCULAR EVENT. ROLE OF THE PHYSICIAN RECOMMENDATIONS IN ORDER TO AVOID THE MORBIDITY AND MORTALITY OF PASSENGERS OR BYSTAND

R. RABINOVICH[1], A. BOCHOEYER[1], N. SNETZER[1], M. ABELLA[2], R. FERREYRA[1], N. ATAMANIUK[1]

[1]SANATORIO TRINIDAD MITRE, BUENOS AIRES, ARGENTINA; [2]SANATORIO MODELO QUILMES, BUENOS AIRES, ARGENTINA

After a cardiovascular event (CVE), a sudden cardiac incapacity of a motor vehicle driver may lead to serious injury not only to the driver but also to passengers or bystanders. Motor vehicle accidents are one of the most important causes of death and incapacity. The probability rate to suffer a sudden cardiac incapacitation after CVE in patients (pts) who drive is over 2%.
Purpose In this pilot study, we present our investigation concerning medical behavior in patients who suffered a CVE with the aim to avoid traffic accidents.

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Material and Method The data was retrieved from the medical records and from a telephone interview of 323 pts who presented a CVE in the last six months. Patient population: mean age: 62 years old, 61% male. CVE: acute coronary syndrome 143 pts, cardiac surgery 35 pts, pacemaker or implantable defibrillator (PCM/ICD) 35 pts and syncope 12 pts (98 out of 323 pts were exclude to the telephone interview because did not drive any vehicle.
Results Neither restriction nor recommendations to drive motor vehicles were found in any of the 323 medical records. Results of telephone interview: Physician behavior made (yes*/not): pts with Acute Coronary Syndrome (23.7%/76.3%), PCM/ICD (22.8%/77.2%), Cardiac Surgery (34.2%/65.8%) and Syncope (0/100%). *Oral Physician behavior to avoid motor vehicle driving during a mean period of 32.8 days was made.
Conclusions In this pilot study of pts after CVE, physician behavior in reference to avoid a motor vehicle injury was very poor. Could be mandatory to create a physician compliance with this reality and a guidelines may be necessary in order to decrease the motor vehicle injury related in this selected population.

[05]
AED AND CPR VIDEO TRAINING IN THE HOME AUTOMATIC EXTERNAL DEFIBRILLATOR TRIAL (HAT)

J. ANDERSON, C. MUNKERS, E. BISCHOFF, G. JOHNSON, A. BROWN, J. POOLE, K. LEE, S. MCNULTY, D. MARK, G. BARDY

SEATTLE INSTITUTE FOR CARDIAC RESEARCH, SEATTLE, USA; DUKE UNIVERSITY, DURHAM, USA

Purpose Automated External Defibrillators (AEDs) can now be used without extensive training. As part of a large randomized clinical trial evaluating AEDs in the home, we evaluated how AED and CPR video training influenced learning during rescuer evaluations.
Methods HAT randomized 7001 patients with anterior myocardial infarction (AMI) to 2 groups: standard lay response to sudden cardiac arrest (SCA) (call emergency medical services (EMS)/CPR) or the use of an AED designed for lay use (Philips HeartStart) plus the standard response. Our goal for the standard response was immediate notification of EMS and prompt CPR. Our goal for the AED group was administering less than or equal to 3 shocks within 3 minutes of collapse followed by calling EMS and CPR. All participants were given a variety of educational formats teaching how best to respond to SCA (+/-AED). However, video training was required by all. To test the value of our approach, we measured CPR+/-AED skills in a population subset. CPR chest compressions and ventilations were evaluated after establishing no signs of life and calling EMS. For AEDs, we evaluated correct pads placement, delivery of a single shock, call to EMS, and initiating CPR.
Results We tested 180 subjects from the total population: 71 (40%) in the CPR group and 109 (60%) in the AED+CPR group. Using the CPR/AED evaluation mannequin, 58/71 (82%) passed CPR testing. 97/109 (89%) passed AED testing and 70/109 (64%) passed the CPR evaluation in the AED+CPR group. As instructed, 50/109 (46%) applied the AED before calling EMS in a mock SCA situation and 65/71 (92%) called EMS in the CPR group. The average time from establishing no signs of life to first shock was 2:20 minutes.
Conclusions Video training is an effective approach to AED and CPR training and can serve as a viable alternative to standard AED training.

[06]
BIFOCAL RIGHT VENTRICULAR PACING IN CONGESTIVE HEART FAILURE: A PILOT STUDY

D. FOUAD[1], D. RAGAB[2], H. NAGI[3], N. SELEM[4]

[1]ASSIUT UNIVERSIYT HOSPITAL, ASSIUT, EGYPT; [2]CAIRO UNIVERSITY HOSPITAL, CAIRO, EGYPT; [3]CAIRO UNIVERSITY HOSPITAL, CAIRO, EGYPT; [4]ASSIUT UNIVERSIYT HOSPITAL, ASSIUT, EGYPT

Background Cardiac resynchronization (CR) using biventricular pacing (BVP) emerged as a promising technique to treat refractory congestive heart failure (CHF) patients with intraventricular dyssynchrony (IVD). Bifocal right ventricular pacing (BFRVP) without LV pacing was proposed as a new CR method producing narrow QRS without using the coronary sinus or cardiac veins.
Objective To assess the ability of BFRVP to establish CR and improve cardiac performance in patients with refractory CHF associated with IVD.
Patients and Methods Six patients (4 males, 2 females) aged 48.7+11.0 years with severe CHF, NYHA class III-IV, LVEF ¡Ü35% and IVD evidenced by QRS >140 ms and/or intraventricular mechanical delay (IVMD) >50 ms by tissue Doppler were subjected to baseline clinical and echocardiographic assessment. They were paced using BFRVP (4 in Assiut, 2 in Cairo Universities). After 1, 3 months of pacing assessment was repeated and compared to baseline.
Results After 3 months, BFRVP caused significant improvement of EF% (33.7+2.5 to 39.3+1.5%, P<0.01), mitral regurgitation area (4.7+3.8 to 4.0+3.1 cm2, P<0.05) and diastolic filling time (222+34 to 286+97 ms, P<0.01). BFRVP resulted in reverse remodeling evidenced by significant reduction of LVEDD (72.7+10.7 to 70.4+10.6 mm, P<0.05) and LVESD (61.7+7.4 to 57.1+10.2 mm, P<0.01).
BFRVP caused significant shortening of QRS width (155+19 to 130+9 ms, P<0.01) and highly significant reduction of interventricular delay (51.2+13.6 to 20.0+8.1 ms, P<0.0001) and intraventricular delay (91.25+56.4 to 41.25+23.9 ms, P<0.001). Marked clinical improvement was noted: NYHA functional class (3.6+0.5 to 1.8+0.8, P<0.001), 6 minute walking test (268+91 to 388+106 m, P<0.001).
Conclusion BFRVP can be successfully used to achieve CR and improve clinical manifestations in refractory CHF patients. BFRVP can serve as an excellent alternative to the costly, more complex and lengthy procedure of BV pacing.
Key Words Congestive Heart Failure, Cardiac Resynchronization Therapy, Bifocal Right Ventricular Pacing.

[07]
REPERCUSSION OF FUNCTIONAL MITRAL REGURGITATION ON REVERSE REMODELING IN CARDIAC RESYNCHRONIZATION THERAPY

F. CABRERA-BUENO[1], J. PEÑA-HERNANDEZ[2], J. GARCIA-PINILLA[3], M. JIMENEZ-NAVARRO[4], J. GOMEZ-DOBLAS[5], A. BARRERA-CORDERO[6], J. ALZUETA-RODRIGUEZ[7], E. DE TERESA-GALVAN[8]

[1]HOSPITAL UNIVERSITARIO VIRGEN DE LA VICTORIA, MALAGA, SPAIN

Introduction and aim Cardiac resynchronization therapy (CRT) reduces the degree of functional mitral regurgitation (FMR). However, FMR has also been associated with a lack of clinical response to CRT. We undertook this study to determine whether the presence of FMR influences the reverse remodeling induced by CRT.
Methods We used Doppler echocardiography to assess 20 patients with dilated cardiomyopathy before and six months after undergoing CRT. We evaluated the effect of reverse remodeling (reduction ≥10% in end-systolic volume) according to the presence or absence of important FMR, defined as a regurgitant orifice area of (ROA) ≥0.20 cm2.
Results Of the 20 patients (mean age, 64.7±8.2 years, eight women), nine had marked FMR (ROA 0.40±0.12 cm2), six mild or trivial FMR

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(ROA 0.15±0.02 cm2) and five had no FMR. CRT reduced the presence of mitral regurgitation by 33.3% and induced reverse remodeling in 60% of the patients. A ROA ≥0.20 cm2 was associated with a lack of reverse remodeling, despite presenting similar baseline characteristics and a reduction in asynchrony to the other patients. Reverse remodeling was produced in all the other patients, with a significant reduction in end-systolic volume (41.7±21%; p=0.003), accompanied by improvement in the ejection fraction (p=0.003) and myocardial performance index (p=0.027)
Conclusions CRT improved FMR, although the baseline presence of important mitral regurgitation, with a ROA ≥0.20 cm2, in patients undergoing CRT was associated with a lack of response in reverse remodeling.

[08]
ECHOCARDIOGRAPHIC AND CLINICAL RESPONSE TO RESYNCHRONIZATION THERAPY

F. CABRERA-BUENO, J. PEÑA-HERNANDEZ, J. GARCIA-PINILLA, M. JIMENEZ-NAVARRO, J. GOMEZ-DOBLAS, A. BARRERA-CORDERO, J. ALZUETA-RODRIGUEZ , E. DE TERESA-GALVAN

HOSPITAL UNIVERSITARIO VIRGEN DE LA VICTORIA, MALAGA, SPAIN

Introduction In spite of the generalization of cardiac resynchronization therapy (CRT), up to 30% of the patients do not respond to it, therefore the criteria to identify which patients (P) with heart failure (HF) would benefit more from CRT, is continuously being reviewed.
Objective To analyze what proportion of p that undergoes CRT does not respond to it, and to find out if they constitute a population with different clinical or echocardiographic characteristics.
Methods Prospective study of patients with HF sent for CRT. Clinical and echocardiographic characteristics were analyzed. These variables were compared to identify what characterizes "non-responders" patients to CRT.
Results 30 p were included (63.±9 yrs). In 36.7% the etiology was ischemic. The average QRS interval was 171.8±20.6 ms. 29 p (96.7%) displayed intraventricular dyssynchrony, 28 (93.3%) interventricular and 11 (36.7%) atrio-ventricular.
After CRT, a significant improvement in myocardial performance index (MPI) was observed (1.11±0.18 vs. 0.78±0.13; p=0.037), end-systolic volume (ESV) (102.0±42.4 vs 77.5±39.9 ml/m2; p=0.021) and ejection fraction (EF) (21.7±6.6 vs 30.4±8.0%; p=0.050). An improvement in New York Heart Association functional class (3.0 vs 2.1; p=0001) was also observed.10 patients were "non-responders". These patients, presented greater basal QRS width (183.1±22.7 vs 165.9±17.2 ms; p=0.041) and end-diastolic volume (157.9±66.5 vs 117.8±35.5 ml/m2; p=0.049) and greater VTS at follow-up (39.5±4.6 vs 31.0±4.8 ml/m2; p=0.022); and worse EF (19.3±7.3 vs. 33.8±4.6; p=0.002) and MPI (1.01±0.01 vs 0.72±006; p=0.000).
Conclusions 1. CRT is associated with improvement of functional class, MPI, TSV and EF. 2. 33% of patients do not respond to CTR, characterized by a wider basal QRS and more dilated left ventricle and, after CRT, worse EF and MPI and greater TSV.

[09]
CONTRALATERAL LV LEAD PLACEMENT FOR CRT UPGRADES WITH AN IPSILATERAL OCCLUDED SUBCLAVIAN VEIN

D. BEGLEY, J. MCCOMB

FREEMAN HOSPITAL, NEWCASTLE UPON TYNE, UNITED KINGDOM

Cardiac resynchronization therapy (CRT) is a recognized treatment for patients with left ventricular (LV) dysfunction and evidence of LV dysynchrony. Increasing numbers of patients with pacemakers or implantable defibrillators (ICD) may also benefit from CRT. Upgrading existing devices may be challenging. Previous device implantation is complicated by subclavian vein (SCV) thrombosis in a significant minority of patients, making the addition of a coronary sinus LV lead difficult. In this situation options include epicardial LV lead placement, dilatation of subclavian stenoses, removal of old leads, and/or starting afresh on the contralateral side. We report an alternative approach in 2 cases.
A 69 year old man underwent implantation of a left-sided dual chamber pacemaker in 2004 and subsequent AV node ablation for atrial tachycardia. In 2006 this was upgraded to an ICD for primary prevention. He later developed symptoms of congestive cardiac failure (CCF) and underwent upgrade of his ICD to CRT-D via the left SCV. Unfortunately the LV lead displaced. An attempt to position another LV lead was unsuccessful due to the presence of SCV occlusion. An LV lead was successfully positioned via the right SCV and tunneled across the chest wall and connected to the existing device.
A 62 year old man who had a right-sided dual chamber pacemaker implanted in 2000 for intermittent complete heart block developed symptoms of CCF. Venography prior to an attempted upgrade to CRT demonstrated an occluded right SCV. Therefore his LV lead was implanted via the left SCV. Due to the long course from left SCV to the coronary sinus, this lead was extended then tunneled across the chest wall to a new CRT device on the right.
This technique provides a safer and simpler approach to upgrading to CRT in patients with occlusion of the ipsilateral SCV.

[10]
QUALITY OF LIFE IMPROVEMENT IN HEART FAILURE PATIENTS AFTER CARDIAC RESYCHRONIZATION

A. ARDASHEV, A. DZHANDZHGAVA, E. ZHELYAKOV, A. SHAVAROV, S. VOLOSHKO

BURDENKO HEAD CLINICAL HOSPITAL, MOSCOW, RUSSIA

Purpose To evaluate influence of cardiac resynchronization therapy (CRT) on quality of life (QoL) in heart failure (HF) patients.
Materials and Methods The study group consisted of 43 patients (2 women) with NYHA class III, IV HF on whom CRT-device implantations were performed. The mean age of the study group was 69,7±11,9 years. Average follow-up was 13.7±5.4 mos. Russian adapted version of Medical Outcomes Study – Short Form (MOS-SF-36) was administered in our study before and 2, 6 and 12 mos. after CRT implantation.
Results Patients with biventricular pacing had increased either parameters of physical component summary scores or mental component summary scores at 2, 6 and 12 mos. after implantation ($p<0.05$). Through 12 mos. of follow up certain deterioration of QoL values was noted to comparing with 6 mos. measurements (NS).
Conclusion CRT device treatment improves parameters of QoL in patients with severe heart failure through 2, 6 and 12 mos. after implantation comparing with initial values.

[11]
IS LEFT VENTRICULAR DIASTOLIC FUNCTION IMPROVED WITH CARDIAC RESYNCHRONIZATION THERAPY?

N. ANTONIO, L. COELHO, L. ELVAS, J. CRISTOVAO, M. VENTURA, C. PINHEIRO, H. VIEIRA, R. MARTINS, L. GONCALVES, L. PROVIDENCIA

COIMBRA UNIVERSITY HOSPITAL AND MEDICAL SCHOOL, COIMBRA, PORTUGAL

Background Cardiac resynchronization therapy (CRT) in patients with left ventricular systolic dysfunction and electrical dyssynchrony has been shown to improve morbidity and mortality. CRT improves sys-

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tolic performance; however, in diastolic function conflicting results have been published.
Purpose To assess the short-term effects of CRT on left ventricular (LV) diastolic function.
Methods Fifty-eight patients (62% male, 62 +/- 11 years, QRS duration 156 +/- 28 ms, area of regurgitant mitral flow 8.6 +/- 5.2 cm2) were evaluated by two-dimensional Doppler echocardiography immediately prior to and 3 +/- 1 month after CRT. Measurements included LV volumes and ejection fraction (EF), pulsed-wave Doppler (PWD)-derived transmitral filling indices (E- and A-wave velocities, E/A ratio, deceleration time (DT) and diastolic filling time (DFT)).
Results At 3 months, significant improvements were observed in New York Heart Association (NYHA) functional class, LV endsystolic volumes (LVESV) and systolic function. LV dP/dt increased significantly (p<0.01) and LVEF increased >5% in 41 of 58 patients (71%). Regarding to diastolic function, E/A ratio decreased from 1.32 +/- 0.75 to 1.17 +/- 0.80 (p=n.s.), DT increased from 164.96+/-70.02 to 180.09+/-75.90 milliseconds (p=n.s.) and DFT decreased from 474.40+/-202.00 to 472.68+/-214.47 milliseconds (p=n.s.). There was no relation between LV reverse remodeling, NYHA class change or improvement in systolic function and improvement in diastolic function parameters.
Conclusions This work showed no significant changes in measurements of diastolic function. These data suggest that the short-term benefits conferred by CRT on LV systolic function and reverse remodelling were not accompanied by similar improvements in diastolic function.

[12]
CORRELATION OF MECHANICAL DYSSYNCHRONY AND QRS DURATION AS ASSESSED BY CONVENTIONAL SURFACE AND SIGNAL-AVERAGED ECG

G. ANDRIKOPOULOS, S. TZEIS, D. AVRAMIDES, D. SAKELLARIOU, K. TRIANTAFYLLOU,, V. TSAGOU, D. TSILAKIS, A. MANOLIS

FIRST CARDIAC DEPARTMENT, EVAGGELISMOS HOSPITAL, ATHENS, GREECE

Introduction QRS duration has a limited value in identifying the presence of cardiac dyssynchrony among candidates for cardiac resynchronization therapy (CRT). This inconsistency may be partly attributed to the inability of ECG to impart the delayed electrical activation of certain myocardial segments, which albeit of inadequate volume to be displayed in the standard ECG may still display abnormal kinesis detectable by imaging modalities. Total ventricular activation time estimated by signal-averaged ECG incorporates microvolt level signals from myocardial areas with delayed activation and contraction.
Hypothesis We tested whether the duration of the signal-averaged QRS complex is correlated with mechanical dyssynchrony.
Methods We studied 55 consecutive patients who were candidates for CRT (mean age 66 years, 84% males, 53% with ischemic cardiomyopathy, 36% with LBBB). QRS duration was measured with conventional surface ECG and signal-averaged ECG (CS 200, Schiller, CH). Interventricular dyssynchrony was based on the measurement of interventricular mechanical delay (IVMD), defined as the difference between the left and the right ventricular preejection period. Intraventricular dyssynchrony was assessed with tissue Doppler imaging by measuring septal to lateral wall delay.
Results QRS duration as assessed by signal-averaged ECG (SAECG) tended to be lower than the maximal QRS in surface ECG [133.1 (33.3) msec vs 142.9 (34.6) msec, p=0.062]. Interventricular delay was better correlated with total QRS duration estimated by signal-averaged ECG (r=0.45, p=0.001), compared to surface ECG (r=0.31, p=0.022). In the subgroup of patients with LBBB, total QRS duration measured by SAECG but not by surface ECG was significantly correlated with intraventricular delay (r=0.47, p=0.035).
Conclusion In a cohort of consecutive unselected patients with refractory heart failure, who were considered candidates for CRT, QRS duration as estimated by SAECG was better correlated with mechanical dyssynchrony compared to conventional surface ECG, especially in the presence of LBBB.

[13]
SLOW PATHWAY CRYOABLATION DURING ATRIAL FIBRILLATION TO CONTROL VENTRICULAR RATE

J. MARTÍNEZ, A. GARCÍA, J. SÁNCHEZ, M. OLIVA, S. MORENO, I. GIL, J. RUIPÉREZ, M. VALDÉS

HOSPITAL VIRGEN DE LA ARRIXACA, MURCIA, SPAIN

Background and Objectives radiofrequency atrioventricular node modification is infrequently performed in patients with chronic atrial fibrillation (AF) and rapid ventricular response despite medical therapy due to a low success rate and a high incidence of inadvertent AV block. Cryoablation seems to be safer, with a negligible risk of inadvertent AV block. The aim of this prospective study was to assess the efficacy of cryoablation to control the ventricular rate in patients with chronic AF, fast ventricular response and a bimodal RR-interval histogram suggesting a dual AV nodal physiology.
Method 10 patients (7 women, age: 63.3+/-13.5 y) with symptomatic chronic AF, uncontrolled ventricular rate under optimal medical therapy and a bimodal RR histogram in a 24-h Holter recording were included in the study. Transvenous criotherapy applications were delivered in the slow pathway area using an anatomic approach until the conducted RR-intervals became larger than a previously defined value, suggesting an abolition of the conduction trough the slow-pathway.
Results Eight patients presented with heart failure and 2 with palpitation. Conducted short RR intervals were abolished in all patients after an average of 3 applications of criotherapy (range: 1-5) and a mean fluoroscopy time of 12.7 +/- 5.3 min. The average heart rate decreased from 113.9 +/- 23.8 to 73.1 +/- 11.5 bpm. All patients showed a unimodal RR histogram after the procedure. Fast heart rate with short RR intervals recurred early in one patient and was permanently abolished in a second cryoablation procedure.
Conclusion Cryoablation of the slow pathway is an effective and safe method to control the heart rate in patients with chronic atrial fibrillation, fast ventricular response and a bimodal RR-interval histogram. This technique may represent an alternative to the "ablate and pace" strategy commonly used in this population.

[14]
RELATIONSHIP BETWEEN VENTRICULAR TACHYCARDIA AND THE SCAR IN PATIENTS WITH DILATED PHASE OF HYPERTROPHIC CARDIOMYOPATHY

K. YAMASHIRO, K. SATO, T. SUZUKI

TOYOHASI HEART CENTER, TOYOHASI, JAPAN

It has been reported that dilated phase of hypertrophic cardiomyopathy (DHCM) is associated with an increased incidence of ventricular tachycardia (VT) and a poor prognosis. However, the substrate of VT in patients with DHCM is not known well.
Case 1 He is a 59-year old man. He was diagnosed HCM 11 years ago. LVEF decreased gradually. He had a VT attack, and then was implanted ICD seven years ago. And he was implanted CRT device for congestive heart failure 2 yars ago. He had frequent shock by ICD. He underwent catheter ablation (CA) for VT. In the CARTO map, big low voltage area existed in LV apex including scar defined as no signal. During session, 7 VTs was induced. Only one VT was

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mappable, channel of the reentrant circuit existed between two scars. VT was terminated by RF application at the site. About another VTs, the location obtained good pace mapping existed border zone around the low voltage area. We ablated isolated late potentials and delayed potentials in the low voltage area. After procedure, he had no reccurence of VT for 15 months.

Case 2 A 70-year old man who was diagnosed HCM 25 years ago had a sustained VT, and underwent CA for VT using CARTO. LVEF was 45%. All induced 4 VTs were unmappable. Low voltage area existed at only LV apex. The area of delayed enhancement detected by MRI was correspond with the low voltage area. The location obtained good pace mapping existed border zone around the low voltage area. We ablated isolated late potentials and delayed potentials in the low voltage area. After procedure, he had only one episode of VT terminated by burst pacing from ICD during 14 months.

Conclusion In these patients with DHCM, the substrate of VT was in the low voltage area at LV apex.

[15]
CATHETER ABLATION IS EFFECTIVE IN DRUG REFRACTORY INCESSANT VENTRICULAR TACHYCARDIA/VENTRICULAR FIBRILLATION

L. GELLER, S. SZILAGYI, A. ROKA, M. SREJ, G. FULOP, E. ZIMA, B. MERKELY

CARDIOVASCULAR CENTER, SEMMELWEIS UNIVERSITY, BUDAPEST, HUNGARY

Treatment of incessant ventricular tachycardia (VT) regardless of its origin is always challenging. Catheter ablation may be the last therapeutic option if antiarrhythmic (AA) drugs, overdrive pacing, sedation and supportive therapies fail to cease the arrhythmia.

18 postinfarction patients were referred to our department with electrical storm, when AA drugs, overdrive pacing and sedation were ineffective. Postinfarction period was less than 1 month in 3, and more than 5 years in 8 cases, respectively. The average heart rate was 165 (125-210) bpm during VT. Acute coronary syndrome was excluded by coronarography. Electroanatomical mapping system (CARTO) was applied in all patients. In 7 cases permanent hypotension was present, and intraaortic ballon pump was inserted before the ablation.

Incessant VTs were succesfully ablated in all patients (the arrhythmia terminated and was not inducible). 2 patients died after the successful ablation in progressive heart failure 5 and 6 days later. In 10 of 15 monomorphic VT patients the effective ablation line was created in the septal region of the inferior or anterior (6 and 4 cases, respectively) scar border zone. In polymorphic VT and VF patients (n=3) elimination of the arrhythmia inducing ventricular extrasystole was effective. In two patients endocardial ablation was not successful (identical pace-maps were not obtained from the endocardial surface of the heart), therefore epicardial approach was applied, which effectively ceased the VTs.

RF ablation should be attempted in all incessant postinfarction VT cases, where other treatments were not effective. Electroanatomical mapping is essential. In postinfarction patients the septal part of the inferior or anterior scar seems to have considerable significance, however this issue needs further investigation. When endocardial ablation is not effective, epicardial ablation might be attempted. Left ventricular ejection fraction has also considerable significance in short and long time survival after incessant VT ablation.

[16]
ALGORITM OF TOPICAL ECG DIAGNOSTICS FOR LEFT VENTRICULAR ARRHYTMYAS

A. REVISHVILI, R. SNEGUR

A.N. BAKOULEV CENTER FOR CARDIOVASCULAR SURGERY, MOSCOW, RUSSIA

Purpose of study Development of an algorithm of topical diagnostics for non-coronarogenous left ventricular arrhythmias.

Material and Methods In 1998-2007, 100 patients (68 men, 32 women, mean age 26±15 years) with non-coronarogenous left ventricular arrhythmias underwent RFA. In 52 patients the arrhythmogenous focus was located in the LV outflow tract, in 13 patients – in the LV inflow tract, and in 35 patients – in the trabecular portion of the LV. In order to develop an algorithm we have analyzed arrhythmias locations and their ECG criteria on 12-leads ECG tracing (the electrical axe of arrhythmia and average pooled value of the amplitudes of arrhythmic QRS complexes have been determined). The obtained data were compared with the data of pacing LV mapping with the Carto system (Biosense Webster).

The algorithm contains three steps. Step 1. The LV was conventionally divided into 3 segments: the outflow, the middle and the apical portions. According to the statistical analysis the ECG criteria of arrhythmic complexes in leads III, aVR, V1 and V4 were the most reliable for the differentiation of arrhythmias originating from these parts of the LV. Step 2 consisted in the determination of locations in the anterior, middle and inferior LV walls in X-ray-anatomical right oblique view 30°. Topical diagnostics of arrhythmia areas from these walls was based on ECG criteria of arrhythmic complexes in leads II, III and V6. Step 3 was based on the study of the distribution of arrhythmia areas in the septal, central and lateral LV walls, in the left oblique view 45°. At this step we used ECG criteria of ventricular arrhythmias from the leads aVL and V1.

Conclusions We developed an algorithm for topical ECG diagnostics of non-coronarogenous LV arrhytmias with up to 93% diagnostic accuracy.

[17]
RADIOFREQUENCY ABLATION OF VENTRICULAR TACHYARRHYTHMIAS IN PATIENTS WITH ARRHYTHMOGENIC RIGHT VENTRICULAR CARDIOMYOPATHY (ARVC)

N. NAIK, R. YADAV, R. JUNEJA, G. SHARMA, K. TALWAR, V. BAHL

ALL INDIA INSTITUTE OF MEDICAL SCIENCES, NEW DELHI, INDIA

Background Ventricular tachyarrhythmias in ARVC recur frequently despite anti-arrhythmic drug therapy. Radiofrequency ablation (RFA) along with antiarrhythmic drugs maybe a possible alternative in populations unable to afford implantable cardioverter defibrillators.

Methods and Results Radiofrequency ablation was attempted in 14 symptomatic patients with ARVC. Indications for RFA included: incessant VT, frequent VT in spite of drugs, refusal/ inability to afford an ICD and life threatening ventricular arrhythmias. Conventional mapping technique was used in 4 patients before the acquisition of the CARTO system. The clinical VT was ablated in 3 patients (RV inflow in 1 patient and RVOT in 2). The tachycardia mechanism in both the patients with RVOT VT was focal while it was a macro-reentrant tachycardia in the patient with RV inflow VT. Electroanatomic mapping was used in 10 patients of whom 9 underwent RFA – the procedure was abandoned in 1 patient due to frequent hypotensive VT/VF. 22 VT's were induced in these 10 patients (maximum of 4 VT's in one patient). The reentrant circuits were perivalvular (around tricuspid annulus), around RVOT, RV free wall and RV body. Ablation strategy consisted of creating linear lesions connecting scarred

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myocardium to healthy tissue, to the tricuspid annulus, or to other scars. All patients were continued on oral amiodarone after the ablation procedure. Five patients had significant reduction in VT recurrence on a follow-up of 6 months – 3 years (mean follow-up 14±9 months).
Conclusions Amiodarone with "tailored" RF ablation strategy may reduce the incidence of VT's in patients unable to afford an ICD or getting frequent shocks. Whether survival can be improved with this strategy needs more data.

[18]
ARRHYTHMOGENIC SUBSTRATE ABLATION OF VENTRICULAR TACHYCARDIA IN PATIENTS WITH STRUCTURAL HEART DISEASE

A. BERNI, S. NAVA, L. COLIN, M. MARQUEZ MURILLO, J. GOMEZ, D. VICTORIA, J. GONZALEZ-HERMOSILLO, P. ITURRALDE

INSTITUTO NACIONAL DE CARDIOLOGIA IGNACIO CHAVEZ, MEXICO CITY, MEXICO

Purpose To evaluate clinical benefit and acute success of a VT substrate ablation in patients with structural heart disease.
Methods We report 16 consecutive patients (mean age 46±17 years) with structural heart disease and drug-refractory VT, with previous failed ablation. Programmed ventricular stimulation was done for VT induction. If hemodinamicaly stable VT was induced, an activation/voltage map was performed with a CARTO system. If unstable or non sustainded VT was induced, voltage mapping was done during sinus rhythm to define dense scar. Critical isthmus or exit site was identified with entrainment or pacemapping. Ablation lines were targeted to the earliest site of activation or where the pacemapping matched the clinical VT . If a non clinical VT or multiple morphology VTs remained inducible after ablation, the voltage map was used to guide further ablation lines.
Results five patients (31.3%) had ischemic cardiomyopathy; 25% congenital heart disease (2 Ebstein's anomaly, 2 tetralogy of Fallot, surgically corrected); 3 patients (19%) Chagas' disease, one arrhythmogenic right ventricular cardiomyopathy, one myocarditis and another patient had calcified constrictive pericarditis. Mean ejection fraction was 40±15%, mean number of VT episodes/patient was 5.3±1.7. Five patients had ICD with frequent discharges. We induced 39 VTs; 23 distinct to clinical documented VT, 7 hemodinamically unstable. Mean cycle length was 350±50 ms. Acute success (immediate non inducibility) was achieved in 94% of clinical VTs, 84% of non clinical VT and failed ablation in 11.4%. During follow-up (8±4 months) 75% of patients were free of VT, 4 (25%) had recurrence. The number of episodes per patient after the ablation was 0.38±0.7 (p= 0.0001). There were no deaths or mayor complications.
Conclusions VT substrate ablation is an effective adjunctive therapy when multiple VT morphologies or unstable tachycardia are induced.

[19]
RADIOFREQUENCY ABLATION OF VENTRICULAR PREMATURE BEATS ORIGINATING FROM LEFT MAIN CORONARY ARTERY USING MAGNETIC NAVIGATION

A. ARDASHEV, E. ZHELYAKOV, T. SKLYAROVA, M. RYBACHENKO, A. SHAVAROV, S. VOLOSHKO

BURDENKO HEAD CLINICAL HOSPITAL, MOSCOW, RUSSIA

Case-report 26 y.o. symptomatic woman with arrhythmogenic right ventricular dysplasia (ARVD) underwent electrophysiological study and radiofrequency catheter ablation (RFA) using traditional mapping technique (activation mapping and pace-mapping) due to ventricular premature beats (VPB) originating from left Valsalva cusp. Mapping in the area of interest was performed using Stereotaxis magnetic navigation system (Helios catheter has advanced using motor drive system into the aortic root). Simultaneously left coronary artery angiography was performed. Activation mapping revealed optimal ablation site (pre-QRS interval was 46 ms) 10 mm inside the left main coronary artery. Precise mapping at the vicinity of left coronary artery ostium showed low-amplitude sharp potential proceeding the ventricular premature complex by 21 ms. Site of registration of this potential was located about 15 mm from previous position and was acceptable for RF-delivery because of safety reason. RFA was delivered with a preset temperature of 50 degree and power limit of 35 W. VPB was disappeared immediately after ablation started. There were no complications associated with RFA. During 6 mos. of follow-up period patient remained free out of VPB recurrences.
Conclusion Left main coronary artery area could be arrhythmogenic substrate in AVRD patients. Low-amplitude sharp potential might reflect arrhythmogenic substrate activation within the Valsalva cusp. Magnetic navigation approach is of help in ultraprecise mapping and stabilization of exploring catheter in such a vital zone as left main coronary artery os to be.

[20]
DUAL ANTIPLATELET THERAPY AND THROMBOGENESIS DURING RADIOFREQUENCY ABLATION

K. POLYMEROPOULOS[1], V. VASSILIKOS[2], S. PARASKEVAIDIS[2], T. KARAMITSOS[2], S. MOCHLAS[2], I. STYLIADIS[2], K. VASSILIADIS[1], G. PARCHARIDIS[2]

[1]G. PAPANIKOLAOU HOSPITAL, THESSALONIKI, GREECE; [2]AHEPA UNIVERSITY HOSPITAL, ARISTOTLE UNIVERSITY OF THESSALONIKI, THESSALONIKI, GREECE

Purpose To evaluate the thrombogenic response after clopidogrel and aspirin pretreatment, during Radiofrequency Ablation (RFA) procedures.
Methods We studied 42 patients (25 men) who underwent RFA for right heart supraventricular tachycardias (atrioventricular nodal re-entry tachycardia n=26, atrioventricular re-entry tachycardia due to right-sided accessory pathways n=12, and typical atrial flutter n=4). Twenty-one patients (Group A) received clopidogrel (300 mg the day before RFA, followed by 75 mg for one month) and twenty-one (Group B) received clopidogrel plus aspirin (325 mg the day before RFA, followed by 325 mg for one month). Platelet aggregation (PA) induced by ADP and D-dimer (D-d) levels, as marker of fibrinolysis, were determined. Blood samples were collected at baseline, before sheath insertion (T1), after completion of the procedure (T2), 24 hours later (T3) and after 1 month (T4).

TABLE

Group		T1	T2	T3	T4	P value within group x time	P value	Group
ADP (%)	A	60.4±6.9	48.0±4.1	27.0±8.1	16.1±3.9	<0.001	<0.001	
ADP (%)	B	54.0±5.2	32.0±5.5	17.2±3.1	13.6±2.8	<0.001		
D-d (ig/L)	A	19.0±7.2	92.2±16.7	72.1±15.9	21.3±7.0	<0.001	<0.001	
D-d (ig/L)	B	13.6±6.6	63.7±5.6	51.7±5.4	15.3±5.3	<0.001		

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Results ADP-induced aggregation and D-d levels were inhibited significantly compared with baseline at all time points, in both groups (p<0.001). The combination of aspirin and clopidogrel demonstrated more significant inhibition over time (p between groups <0.001) compared to clopidogrel .
Conclusions In patients undergoing RFA procedures, combined administration of aspirin and clopidogrel significantly inhibited platelet aggregation and attenuated fibrinolysis, compared to clopidogrel alone.

[21]
CARDIAC CONTRACTILITY MODULATION BY NON-EXCITATORY ELECTRICAL CURRENT ACUTELY IMPROVES DIASTOLIC FUNCTION IN PATIENTS WITH CHRONIC SYSTOLIC HEART FAILURE

T. BRODHERR[1], M. VOGT[2], N. EIZENBERG[2], B. RUSSO[2], A. MUEGGE[1], T. LAWO[1]

[1]CARDIOLOGY DEPARTMENT, UNIVERSITY-HOSPITAL, BERGMANNSHEIL BOCHUM, GERMANY; [2]IMPULSEDYNAMICS INC., HAIFA, ISRAEL

Introduction Cardiac Contractility Modulation (CCM) by application of non-excitatory currents is an effective therapy for patients with chronic systolic heart failure (CHF) and uncompromised interventricular conduction. Altered transsarcolemmal calcium transients and, in the long term, a modified myocardial gene expression seem to contribute to the observed contractile benefit. Due a maladaptive fetal gene programm in the failing heart, CCM could theroretically worsen diastolic function by increased calcium transients. Therefore we analysed the acute effect of CCM on diastolic function focussing on active isovolumetric relaxation.
Methods A CCM-device (Optimizer II/III) was implanted in 21 patients. The acute effects of CCM on contractility (dP/dtmax), relaxation (dP/dtmin) and preload (left ventricular end-diastolic pressure (LVEDP)) were determined by LV pressure changes acquired with a micromanometer during implantation. Subsequently raw data were smoothed to minimize undesirable artifacts and futher analysed.
Results The mean baseline values for dP/dtmax and dP/dtmin were 1039±268 mm Hg/s and -1005±216 mm Hg/s, respectively. After activation of CCM a significant gain was achieved simultaneously in contractility as well as in active relxation (maximum change of dP/dtmax at 673±440 s and dP/dtmin at 643±513 s; p=0.39). These beneficial effects were detected both by raw data analysis (delta-dP/dtmax: +8.9%, p<0.0001; delta-dP/dtmin: + 7.1%, p<0.0001) and after applying smoothing functions (delta-dP/dtmax-smoothed: +6.5%, p<0.0001; delta-dP/dtmin-smoothed: +4.7%, p<0.0001). Increased contractility and relaxation was found as well in patients with and without changes in LVEDP under CCM-conditions.
Conclusions Though the acute beneficial impact of CCM-stimulation is thought to be mediated by enhanced systolic calcium transients, an increase of diastolic capacity in terms of active relaxation was detected. The advantagous effects on contractility and relaxation seem to independent of changes in preload.

[22]
A CASE OF MIGRATION OF AN EPICARDIAL PACEMAKER GENERATOR INTO THE PREPERITONEAL FAT IN A CHILD DURING HIGH GROWTH VELOCITY PERIOD

K. HASHIZUME[1], S. SUZUKI[2], H. KANKI[3], R. TAKAHASHI[1], Y. INOUE[1], I. KASHIMA[1], K. KOIZUMI[1], N. ISHIKAWA[4], Y. AOKI[4]

[1]SAISIKAI UTSUNOMIYA HOSPITAL, UTSUNOMIYA, JAPAN; [2]HIRATSUKA CITY HOSPITAL, HIRATSUKA, JAPAN; [3]SAITAMA MUNICIPAL HOSPITAL, SAITAMA, JAPAN; [4]NIHON KOHDEN CORPORATION, TOKYO, JAPAN

Purpose We report a unique case of migration of an epicardial pacemaker generator into the preperitoneal fat in a child during high growth velocity period.
Result A 6-year-old female underwent pacemaker implantation because of symptomatic bradyarrhythmia due to sick sinus syndrome. A permanent epicardial VVIR pacemaker system was implanted posterior to the right side of the rectus abdominis muscle sheath. The generator was exchanged because of battery consumption at 8 y/o. After 5 years, at the second generator exchange operation, the pacemaker-programming device detected that the generator was not in the location that we implanted in the last time but in the lower abdomen.
Furthermore, the generator was in a different place than a year prior. Because the pacemaker generator was not detected by manipulation, we confirmed the position with the programmer before sterilization. At first we were not able to find the generator due to migration during operation although we performed the skin incision at the marked site. By pulling the lead we finally retracted the old generator from preperitoneal fat space and exchanged it for a new one. The patient was discharged uneventfully after operation.
Discussion Even if fixation of the generator is successful, migration is possible due to anatomical changes caused by the high growth velocity period in school age children and somatic growth marked in long axes. In fact, this patient grew about 27 cm from 8 y/o to 13 y/o. The possibility of this unusual complication should be considered in these patients by placing the generator pocket in the upper abdominal wall.
Conclusion Even if a generator is fixed well and there is no infectious medical history, it is important to consider migration by growth and to confirm the generator position under X-ray. And it is necessary to fix it again immediately when recognizing a tendency of displacement to prevent complications by generator migration.

[23]
PACING FOR SYMPTOMATIC AV BLOCK: SAFETY AND EFFICACY OF VDD COMPARED TO DDD PACING

D. FOUAD, H. ALY

ASSIUT UNIVERSITY, ASSIUT, EGYPT

Background Providing similar hemodynamic benefits, single lead atrial synchronous ventricular pacing (VDD) is used increasingly instead of conventional dual chamber pacing (DDD) for atrioventricular (AV) block and preserved sinus node function patients. However, VDD pacing is still underused in many localities including ours.
Objective To review the use, safety and efficacy of long-term VDD compared to DDD pacing in our locality.
Patients and Methods A study of all patients with atrioventricular block and normal sinus node function implanted with dual-chamber pacemakers over a 10-year period (26 DDD, 15 VDD) at our department was performed. Data on complications, atrial sensing and maintenance of AV synchrony during implant and follow-up were obtained from a prospective registry and analyzed.
Results The implant time was significantly reduced in VDD than DDD patients (60±26 vs 84±20 min, P<0.05). The implant P wave was significantly higher in DDD than VDD pacing (3.92±1.53 vs 2.71±1.30 mV, P<0.01), but was comparable at pre-discharge and last follow-up visit (1.93±1.0 vs 1.47±0.65, 1.75±1.0 vs 1.18±0.82 mV), P>0.05 for both. Total complication rate was comparable in DDD, VDD groups (24% vs 26%, P>0.05). AF rate was 12% in DDD vs 13.3% in VDD patients, P>0.05. However, it was persistent in 12% DDD vs 6.6% VDD patients, P<0.01. Atrial undersensing occurred in 4% DDD vs 13.3% VDD patients, P>0.01. At the last follow-up visit, maintenance of pacing mode and AV synchrony were comparable in DDD and VDD patients (88% vs 86.6% and 88% vs 80% respectively), P>0.05 for both.

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Conclusion VDD pacing can provide excellent long-term performance in AV block patients with normal sinus node function. They are as safe and effective in maintaining physiological AV synchronoy as DDD.

[24]
TILT-INDUCED HEMODYNAMIC ADAPTATION ASSESSED BY TRANS-VALVULAR IMPEDANCE SENSOR

F. GIADA[1], G. GASPARINI[1], M. MADALOSSO[1], F. DI GREGORIO[2], E. FAVERO[2], R. CHIRIFE[3], A. RAVIELE[1]

[1]DEPARTMENT OF CARDIOLOGY, UMBERTO I HOSPITAL, VENICE-MESTRE ITALY; [2]MEDICO SPA, RUBANO (PADOVA), ITALY; [3]CARDIOLOGY SERVICE, FERNANDEZ HOSPITAL, BUENOS AIRES, ARGENTINA

Autonomic chronotropic and inotropic regulation is essential to compensate for postural effects on ventricular preload and cardiac output. The Trans-Valvular Impedance sensor (TVI) is a tool available in Sophòs pacemakers (Medico, Padova, Italy) to monitor preload and contractility in the right ventricle. This pilot study was aimed at evaluating TVI indications during head-up tilt test (HUT). Three pacemaker patients were studied during HUT at 60°. They were affected by sick-sinus syndrome, without history of syncope, and had previously shown appropriate chronotropic adaptation during treadmill test. The pacing device (Sophòs 151) was programmed in DDD at low rate (40 bpm), to prevent atrial stimulation and assess the sinus-node response to HUT. End-diastolic (ED) and end-systolic (ES) TVI were measured beat-by-beat and eight-beat averages were stored in the pacemaker memory every 8 s, together with the simultaneous heart rate. TVI waveform samples were also recorded by real-time telemetry. Basal EDTVI and ESTVI were normalized to hypothetical volumes of 160 and 90 ml, respectively, in order to express any TVI modification as corresponding volume changes. TVI-indicated end-diastolic volume (EDV) and ejection fraction (EF) were considered as preload and contractility markers. The first patient showed 8% increase in sinus rate (SR) and 3.2% decrease in EDV after tilting. The second showed no significant change in SR, with 2% EDV reduction and 31% increase in EF. The third patient's rate was stable for 8 min after HUT, when a cardioinhibitory response was noticed, with sinus rhythm replaced by atrial pacing at 40 bpm and then by a slow junctional rhythm. Preload decreased by 10%, and a marked increase in contractility (42%) preceded and accompanied this phase, suggesting that rate-responsive pacing controlled by TVI might have been beneficial. These preliminary results indicate that TVI can reflect preload and contractility modifications during postural challenges.

[25]
RIGHT VENTRICULAR OUTFLOW TRACT PACING IMPROVES DYSSYNCHRONY PARAMETERS WHEN COMPARED WITH TRADITIONAL APICAL PACING: 6 MONTH FOLLOW-UP OF A RANDOMIZED TRIAL

O. CANO PÉREZ, J. OSCA ASENSI, M. SANCHO-TELLO DE CARRANZA, J. OLAGÜE DE ROS, M. IZQUIERDO DE FRANCISCO, J. CASTRO PAREJA, A. SALVADOR SANZ

LA FE UNIVERSITY HOSPITAL, VALENCIA, SPAIN

Background Chronic right ventricular apical pacing (RVAP) has been associated with cardiac dyssynchrony and impaired ventricular function. To date there are limited echocardiografic data referring to alternative pacing sites. The aim of this study was to prospectively evaluate echocardiographic differences in patients with right ventricular outflow tract pacing (RVOTP) versus RVAP.
Methods We designed a randomized, single-blind study in which patients with pacemaker indication were randomly assigned to receive a screw-in lead in the RVA or in the RVOT. Patients with structural heart disease were excluded. Enrollment began on January 2006. Until December 2006, 68 patients had completed 6 month follow-up (39 m, mean age 72 years, AV block n=39, SSS n=29) with 34 patients randomized to RVOT pacing and 34 to RVA pacing. We investigated systolic and diastolic function as well as dyssynchrony parameters in the first week after implant and at 6 months of follow-up. Intraventricular dyssynchrony was evaluated with tissular doppler imaging from the beginning of the QRS to the peak of systolic wave at the six basal wall segments.
Results Cumulative percent ventricular paced (Cum%VP) was 68±37% in RVOTP group versus 58±42% in RVAP group, p=0,3. There were no significant differences in dyssynchrony parameters in the first week post-implant echocardiographic evaluation except for the interventricular delay (IVD) (28,8±18,6 ms in the RVAP group vs 15,7±13,6 ms in the RVOTP group, p=0,003). However, patients with RVAP had more inter and intraventricular delay compared with RVOTP group at 6 month follow-up (IVD 28,2±18,8 vs 17,8±12,1 ms, p=0,01; septal to lateral wall delay 45,2±39,7 vs 27,3±23,5 ms, p=0,04). No differences in systolic and diastolic function were assessed.
Conclusions Right ventricular apical pacing induces inter and intraventricular dyssynchrony that can be counteracted by RVOTP. The RVOT could be an alternative pacing site in selected patients to reduce the deleterious effects of tradicional RVAP.

[26]
INTRA-CARDIAC IMPEDANCE AND OPTIMISING CARDIAC DYSSYNCHRONY: AN ELECTRICAL SOLUTION FOR AN ELECTRICAL PROBLEM?

R. VEASEY[1], J. SILBERBAUER[1], P. HONG[1], D. HASTINGS[2], N. MADDEKAR[1], N. PATEL[1], G. LLOYD[1], N. SULKE[1]

[1]EAST SUSSEX HOSPITALS NHS TRUST, EASTBOURNE, UNITED KINGDOM; [2]MICRO SYSTEMS ENGINEERING INC., LAKE OSWEGO, USA

Introduction Outstanding issues with cardiac resynchronisation therapy (CRT) include non-responders, lengthy optimisation and re-optimisations and exercise-induced dyssynchrony. Frequent device auto-optimisation is therefore desirable. The Closed Loop System is a pacemaker sensor which utilises intra-cardiac impedance measurements throughout the cardiac cycle. We examined whether intra-cardiac impedance could act as a surrogate for traditional tissue Doppler imaging (TDI) indices of dyssynchrony in 'ablate and pace' patients.
Method 26 patients (73±7.4) with permanent atrial fibrillation were randomised to right ventricular apical (n=14) or high septal VVI pacing prior to AV nodal ablation. Post-ablation, the time from Q wave to onset and peak systolic TDI were recorded at the basal interventricular septum and basal RV free wall at rest. This data was correlated with resting systolic peak and trough intra-cardiac impedance.
Results With septal pacing, the mean times from Q wave to start and peak systolic septal myocardial velocities were 228±28 ms and 283±33 ms. The mean times from septal ventricular pacing spike to peak and trough impedance recordings were 116±52 ms and 183±64 ms.
With apical pacing, the mean times from Q wave to start and peak systolic RV free wall myocardial velocities were 195±37 ms and 272±32 ms. The mean times from apical ventricular pacing spike to peak and trough impedance recordings were 132±39 ms and 196±46 ms.
Pacemaker-derived septal peak and trough intra-cardiac impedances significantly correlated with Q wave to start (R=0.83, p=0.02 and R=0.87, p=0.01) and Q wave to peak (R=0.3, p=0.06 and R=0.80, p=0.03) echo-based septal TDI measures. RV apical intra-cardiac impedance timings did not correlate with RV free-wall tissue velocities.
Conclusions Localised cardiac timings for impedance measures correlate with peak systolic myocardial velocities timings. Utilisation of this principle may enable development of cardiac resynchronisation

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devices capable of both automatic and dynamic optimisation. The feasibility of this methodology with left ventricular epicardial or transventricular impedance requires assessment.

[27]
CARDIAC RESYNCHRONIZATION THERAPY: VARIATIONS IN OPTIMIZED ATRIOVENTRICULAR DELAY FROM REST TO EXERCISE

C. VALZANIA[1], F. GADLER[2], V. RENDELIUS[3], G. BORIANI[1], M. ERIKSSON[3]

[1]INSTITUTE OF CARDIOLOGY, UNIVERSITY OF BOLOGNA, BOLOGNA, ITALY; [2]DEPARTMENT OF CARDIOLOGY, KAROLINSKA INSTITUTE, STOCKHOLM, SWEDEN; [3]DEPARTMENT OF CLINICAL PHYSIOLOGY, KAROLINSKA INSTITUTE, STOCKHOLM, SWEDEN

Aim In cardiac resynchronization therapy (CRT) patients, we sought to investigate variations from rest to exercise in optimal atrio–ventricular (PV/AV) delay and the haemodynamic impact of AV optimization during rest and exercise.
Methods Fourteen patients (66±10 yr; 86% men; 64% ischemic), implanted with a CRT-D device, underwent an AV delay optimization, by echocardiography and an automated electrogram method (IEGM), both at rest and during bicycle exercise. The echocardiographic optimization was performed by measuring the aortic velocity time integral (VTI) at AV intervals ranging from 80 ms to 180 ms.
Results At rest, optimal PV and AV delay (by echocardiography) were 131±27 ms and 176±28 ms, respectively. According to the IEGM method, at rest optimal PV delay was 126±22 ms (p=n.s. vs. echocardiography); optimal AV delay was 175±21 ms (p=n.s. vs echocardiography). No significant difference in PV/AV delay was observed between rest and exercise. Echocardiography–guided AV optimization increased aortic VTI at rest from 14.5±3.9 cm (spontaneous rhythm) to 16.5±4.4 cm (p<0.001), and during exercise from 16.5±3.8 cm to 18.1±4.8 cm (p<0.001). The increase in aortic VTI was similar at rest and during exercise (+2.0±1.2 cm vs +1.6±1.3 cm, p=n.s.). Also IEGM–guided AV optimization increased aortic VTI to a similar extent at rest and during exercise (+1.6±1.2 cm vs +1.4±1.3 cm, p=n.s.). Aortic VTI at optimal PV by IEGM method correlated with aortic VTI at optimal PV by echocardiography both at rest (r=0.99; p=0.008) and during exercise (r=0.99; p=0.02).
Conclusions No significant variations in optimized AV delays were observed between rest and exercise. AV optimization provided a similar increase in aortic VTI at rest and during exercise. In CRT patients, a fixed, rather than dynamic shortened, optimal AV delay may improve the haemodynamic response to exercise.

[28]
AUTOMATIC CAPTURE IN CLINICAL PRACTICE REDUCES ENERGY OF STIMULATION ASSURING SAFETY FOR PATIENTS

M. LICCARDO[1], A. GUARDASCIONE[1], A. MARINO[1], P. NOCERINO[1], A. BORRINO[1], C. CARBONE[1], L. PRATO[2], C. CIARDIELLO[2]

[1]OSP. S. MARIA DELLE GRAZIE, POZZUOLI (NA), ITALY; [2]GUIDANT-BOSTON SCIENTIFIC, MILANO, ITALY

Background Algorithm created to program optimal output in pace maker (PM), such like Automatic Capture (Boston Scientific), are diffused even though the impact of their utilization in clinical practice is not much described in literature.
Aim The object of this study is to assess the impact of automatic capture on energy of stimulation in PM implanted in a non selected population with different lead characteristics.
Methods 69 patients (mean age 77±9, 61% male, 17% CAD) were implanted with Insignia PM with automatic capture capability. Energy of stimulation, expressed in microJoule, is defined as the product of the square of output and duration divided by lead impedance. Automatic ventricular Output (AO) was fixed by PM as stimulation threshold plus 0,5 Volt, we also assumed a manual output (MO) defined as three times the threshold and based on common clinical practice.
Results In all patients automatic capture is able to safely detect ventricular threshold, at 6 months follow-up no patients have needed to reprogram in manual the device. The mean energy of stimulation of a singular beat with AO and MO are 0,88±0,39 and 1,22±1,05 microJoule respectively (p=0,014).
Conclusion Use of automatic capture ensures pacing with safety margin and considerably reduced energy of stimulation.

[29]
AUTOMATIC ATRIAL THRESHOLD IN PACING : CLINICAL EVALUATION OF A NEW ALGORITHM GENERATION

M. HERO[1], M. GUENOUN[2]

[1]MEDTRONIC, BOULOGNE BILLANCOURT, FRANCE; [2]CLINIQUE BOUCHARD, MARSEILLE, FRANCE

Background and aim If automatic threshold and automatic output adaptation is usual in ventricular pacing, these functions at the atrial level are new and less well evaluated. The purpose of this study is to compare manual atrial threshold (MAT) and the automatic atrial capture management function (ACM) of a new generation of pacemakers (PM) .
Methods and results The CASA study has included 326 patients in France implanted with an EnPulse® dual chamber PM (Medtronic, Minneapolis, USA) until april 2006. Patients are 76 +/- 10 years old, indications were atrio-ventricular block (AVB) 60% and sinus dysfunction (SD) 35%. 27% had paroxystic atrial arrhythmias before implantation. Measures of P wave, manual atrial threshold and impedance have been realized at implantation, before discharge, 6 to 12 weeks after and during a 6 month follow-up. At each test automatic atrial threshold was collected by PM telemetry.
Means of P waves are stable and impedances decrease through the follow-ups. There are no significative difference between manual and automatic atrial threshold values at each step of the protocol and the R coefficient correlations are very high confirming a very strong coherence between the two methods.

	P Wave (mV)	MAT (Volt)	ACM (Volt)	Impedance R (Ohm)	coefficient
Implant (300 pts)	2.9±2.1	0.8±0.5	612±227		
Post-op (297)	2.8±1.5	0.7±0.5[1]	0.7±0.4[1]	534±158[1]	0.918
6-12 Weeks (222)	2.7±1.5	0.6±0.4[2]	0.7±0.4[2]	518±148[2]	0.929
6 month (177)	2.7±1.6	0.7±0.4[3]	0.7±0.5[3]	499±143[3]	0.947

The means values of the absolute value differences between the MAT and the ACM are:
Post-op=0.013 Volt, 6-12 weeks=0.029 Volt and 6 month=0.039 Volt.

Conclusion The CASA study shows that the automatic atrial capture management function has a very high sensibility and specificity to measure the daily atrial threshold, and adapt the amplitude parameter of the atrial stimulation. Impacts on pacemaker longevity atrial stimulation reliability and occurence of atrial arrhythmias have to be evaluated by further studies

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[30]
REDUCING VENTRICULAR PACING THROUGH NEW PACING MODALITIES. TOWARDS ENDING IATROGENY?

D. DURÃO, V. MARTINS, A. FRANCISCO, J. ALCARAVELA, S. PERNENCAR, M. PERES, M. LUZ PITTA, J. ARANHA, I. MONTEIRO, M. LEAL, J. LOUREIRO, G. SILVA

HOSPITAL SANTARÉM, SANTARÉM, PORTUGAL

Introduction Inappropriate ventricular pacing (VP) is associated to higher prevalence of heart failure and atrial fibrillation. There are now new modes of dual chamber pacing which privilege patient¡¯s intrinsic rhythm or atrial pacing, ensuring, if necessary, switch to DDD-mode.

Methods We aimed at evaluating the efficacy of MVP mode (Medtronic) and AAIsafeR2 (ELA Medical) in reducing VP, by comparing it to DDD mode with AV interval optimisation (DDD/AVopt).

We retrospectively studied patients admitted to our Cardiology Department for permanent pacemaker implantation from 22/02/2006 to 30/09/2006, with a minimum follow-up of 3 months, considering Group A (MVP/AAIsafeR2) and Group B (DDD/AVopt), and compared them as for age, sex, pacing indication and number of patients (within each group) with <50% VP, 0% VP, >50% atrial pacing and >50% sinus rhythm (SR).

Results There were no significant differences in what concerns to age and sex. Sinus sick syndrome was a more frequent pacing indication in Group A (61,2% vs 22.5%, p=0,0001), whereas second degree BAV and complete BAV were more frequent in Group.B (65% vs 22.6%, p<0.0001).

In what concerns to the % of VP, Group A had significantly more patients with PV 0% and with PV <50%, more patients with atrial pacing >50% as well as with SR >50% (see table).

Conclusions New pacing programming modalities avoid unnecessary and inappropriate ventricular pacing, which, at the actual state of art, might be an open road to preventing heart failure and atrial fibrillation in patients who need permanent pacemaker implantation.

	Vent. Pacing¡Ü50%	Vent. Pacing=0	AAI Pacing ¡?50%	Sinus Rhythm 50%
MVP/ AAIsafeR2 (31 patients)	29	13	16	12
DDD/AVopt (80 patients)	18	2	4	9
p	<0,0001	<0,0001	<0,0001	0,003

[31]
RELATION BETWEEN RIGHT VENTRICULAR MYOCARDIAL DYSFUNCTION AND EKG ABNORMALITIES IN PEDIATRIC PATIENTS AFTER REPAIR OF TETRALOGY OF FALLOT

K. WENG, C. LIN, P. LIU, K. CHEIN, K. HSIEH

KAOHSIUNG VETERANS GENERAL HOSPITAL, KAOHSIUNG, TAIWAN

Purpose Abnormal depolarization-repolarization in patients with repaired tetralogy of Fallot (T/F) is a risk factor for malignant ventricular tachycardia and sudden death. The aim of this study is to determine the relationship between RV dysfunction and EKG abnormalities in pediatric patients with repaired T/F.

Methods Thirty-six patients with repaired T/F (8.7±2.8 years) and 30 age-matched healthy control subjects (8.6±2.9 years) were studied. Regional myocardial contraction and diastolic function of biventricular lateral wall and interventricular septum were examined from base to apex with tissue Doppler imaging and 2D strain. The following parameters were measured: longitudinal strain, radial strain, circumferential strain, systolic peak velocities (Sm), early (Em) and late (Am) diastolic velocities, and Em/Am ratio. The tissue Doppler-derived Tei index was used to assess the global right ventricular function. ECG was analyzed for QRS and QTc.

Results Compared with normal subjects, patients with repaired T/F had significantly reduced myocardial strain (p<0.05), lower Sm (p<0.01), lower Em (p<0.01), lower Em/Am (p<0.01), greater Tei index (p<0.01). In patients with repaired T/F, QRS duration ranged from 85 to 175 ms and correlated with Tei index (r=0.56). Patients with QRS >120 ms had significantly reduced myocardial strain of interventricular septum (p<0.05), lower Sm (p<0.05), lower Em (p<0.05), lower Em/Am (p<0.01), greater Tei index (p<0.01) than those with QRS <120 ms. All patients had normal QTc.

Conclusions Tissue Doppler imaging and 2D strain showed that patients with repaired T/F had impaired RV function. RV dysfunction are associated with abnormal depolarization- repolarization, especially for patients with QRS prolongation. Tissue Doppler imaging and 2D strain can be used as a valuable tool to follow up these patients.

[32]
NOVEL ELECTROCARDIOGRAM DEVICE WITH WEB BASED SERVICE CENTRE FOR AMBULATORY ECG MONITORING STUDY (NEW)

B. TAN, C. CHING, K. HO, W. TEO

NATIONAL HEART CENTRE, SINGAPORE, SINGAPORE

Introduction Arrhythmias are often intermittent and a normal ECG may not be diagnostic. Transtelephonic ECGs are useful to document such arrhythmias.

Objective To evaluate the usefulness of HeartWave500 (NextWave Biomedical), a novel web based ambulatory ECG monitoring device.

Methodology This is a prospective study, involving 120 patients from the National Heart Centre, Singapore. They were randomized in a 3:1 ratio to either HeartWave500 (HW) or a standard Transtelephonic event recorder (TT). HW records 5 leads, and transmits to an internet site. The attending physician receives an SMS and an e-mail of the recorded ECG and can reply via the same site. A computer generated report is also accessible to the patient. TT transmits audio data to a central station. Recorded events are read the next working day. Monitoring was for 2 weeks. Diagnostic yield was calculated in two ways: 1) the percentage of patients successfully diagnosed as a function of time and 2) the absolute number of new diagnosis/patient/week.

Results 33 patients (male 14, female 19; mean age 49.6±11.1years) were randomized to TT. 87 patients (male 32, female 55; mean age 43.7±12.2 years) were randomized to HW. At two weeks, the percentage of patients diagnosed with any arrhythmia was 67.8% for HW and 66.7% for TT. For the TT, 0.70 and 0.73 diagnosis/patient/week were made in week one and two respectively versus 0.62 and 0.56 for HW.

Transmitted ECGs were read earlier for HW (Median 18 minutes, min 0, max 3511), compared to TT (Median 1107 minutes, min 2, max 19581, Mann-Whitney non-parametric test, P<0.05). Transmitted recordings that were unreadable was also significantly lower for HW (8.0% vs 17.6%, Chi-Square test, P<0.05).

Conclusion HW and TT have similar diagnostic yields. However, the ability to record and transmit using the web, earlier review of data and low unreadable data, makes HW a preferred alternative.

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[33]
EFFECT RADIOFREQUENCY CATHETER ABLATION ON MYOCARDIAL ELECTROMECHANICAL PROPERTIES IN WPW SYNDROME PATIENTS

O. MURZINA, I. KOVALYOV, L. SVINTSOVA, G. MARTSYNKEVICH, S. POPOV

INSTITUTION OF CARDIOLOGY, TOMSK, RUSSIA

Aim To define myocardial muscle electromechanical properties (EMP) in WPW syndrome (WPWS) children before and after radiofrequency ablation.
Material and Methods We examined 40 WPWS children aged 10-18 years and 30 healthy children. Atrial EM intervals were measured on the level of AV circles, ventricular ones were measured on middle ventricular segments level.
Results WPWS children revealed stable tendency to earlier mechanical response in posterior and anterior left atrium (LA) parts compared to healthy children. Marked variability of EMP in several left ventriculum (LV) walls was seen in manifest WPWS children. While assessing intraventricular asynchrony between anterior wall of LV and intraventricular septum, maximum difference of EM intervals was seen in manifest WPWS children. EM intervals of left ventricular posterior and anterior walls did not differ in healthy children, but WPWS children revealed increased intraventricular asynchrony which led to reliable posterior wall EM interval lengthening. Disturbed asynchrony of ventricular walls' contraction in manifest WPWS children led to mild but reliable LV pumping function depression which resulted in increased LV stroke volume. In one year after radiofrequency ablation, normalizing EMP in manifest WPWS children resulted in increased LV stroke volume which did not differ from that of healthy children.
Conclusion Marked intraventriculal asynchrony is additional indication to performing radiofrequency ablation of additional atrioventricular junction in WPWS children without history of documented tachycardia episodes.

[34]
CATECHOLAMINERGIC POLYMORPHIC VENTRICULAR TACHYCARDIA IN CHILDREN

V. MILOVSKY[1,2,3], M. LAKOMY[2], A. JURKO[4], V. ILLIKOVA[2]

[1]CONSTANTINE THE PHILOSOPHER UNIVERSITY, NITRA, SLOVAK REPUBLIC; [2]CHILDRENS CARDIAC CENTRE, BRATISLAVA, SLOVAK REPUBLIC; [3]SLOVAK MEDICAL UNIVERSITY, BRATISLAVA, SLOVAK REPUBLIC; [4]JESENIUS UNIVERSITY, MARTIN, SLOVAK REPUBLIC

Catecholaminergic polymorphic ventricular tachycardia (CPVT) is inherited arrhythmia with occurence of specific ventricular tachycardias, syncope and/or of sudden death.
Group of patients: Two children and mother of one of our pts with CPVT.
Results Pt. Nº 1 a 12-year-old girl with CATCH 22 syndrome, with chromosomal 22q locus deletion. At the age of 11 years we found ventricular extrasystoles (VEx), and bidirectional ventricular tachycardia (VT) typical for CPVT. Metroprolol worsened bradycardias, so it was replaced by propafenone.ívny
Pt Nº 2 a 16-year-old boy with collapses during last four years provoked by exercise or sudden orthostasis. Heart structures and function were normal on echo, TDI, and MR. Basal ecg was normal. On Holter monitoring random ventricular extrasystoles and slight bradycardia were found. Exercise test provoked ventricular bigeminy and polymorphic VT. Metoprolol did not abolished extrasystoles and VTs, so it was replaced by propafenone, which abolished bradycardia, VEX and VTs on exercise test.
Pt. Nº 3 a mother of pt. 2, experienced frequent collapses and episodes of rapid heart rates in the past. No specific cardiac investigations were undertaken. She had frequent ventricular extrasystoles and exercise testing provoked polymorphic VTs, abolished by metoprolol. Blood samples of all pts are being genetically tested at the moment for RyR 2 mutations.
Follow up Pt. Nº 1 with Catch 22 syndrome is without tachycardias. Pt. Nº 2 after 6 months of therapy experienced resuscitated syncope and dual chamber ICD was implanted. Pt. Nº 3 suddenly died just before AICD implantation.
Conclusion Our children with CPVT because of sinus node dysfunction betablockers were replaced by propafenone. In case of syncope AICD is indicated also in children.

[35]
PREDICTION OF ARRHYTHMIAS IN CHILDREN AT EARLY AGE IN SHORT-TERM PERIOD AFTER SURGICAL CORRECTION OF TETRALOGY OF FALLOT

E. GOLUKHOVA, L. BOCKERIA, A. KIM, R. SEROV, I. EGOROVA, K. MINJIA

BAKOULEV SCIENTIFIC CENTER FOR CARDIOVASCULAR SURGERY RAMS, MOSCOW, RUSSIA

Aim Reveal most frequently occurred arryhthmias and their predictors in the early postoperative period after surgical correction of tetralogy of Fallot (TOF) in children at early age.
Material and Methods 60 patients with TOF were enrolled in our study. Inclusion criteria were: arrhythmias and conduction disorders in early postoperative period after surgical correction of TOF. Exclusion criteria were: children at the age of over 3 years and arrhythmias before surgery. We analysed 2 groups: group 1 – 24 (40%) patients with arrythmias after surgery and group 2 – 36 (60%) patients without arrhythmias after surgery. Along with noninvasive methods, histological investigation of right ventricle was performed.
Results Ventricular arrhythmias (VA) occurred in 83,3% of patients early after radical surgical correction of TOF, supraventricular arrhythmias (mainly single ectopic beats in 66,7% of patients) and atrioventricular (AV) nodal tachycardia – in 62,5%. VA occurred significantly more often than supraventricular arrhythmias. These rhythm and some conduction disorders (i.e., AV block 2 degree) were mostly transient. Preoperative predictors of these arrhythmias were age of over 18 months and the history of palliative surgery. Intraoperative predictors included cardiopulmonary bypass time >90 minutes and aortic cross clamping time >50 minutes. Predictors of VA were as follows: QRS duration more than 100msec, QT dispersion more than 50msec, calculated pressure in right ventricle (RV) >65 mm Hg and the RV end diastolic volume >50 ml. Predictors of supraventricular arrhythmias were P-wave duration >95 msec and P-wave dispersion more than 20 msec.
Conclusion Early postoperative arrhythmias in children after surgery of TOF occur due to initial hemodynamic changes, leading to hypoxemia, myocardial electrical disorders, dilatation of heart chambers and ventricular hypertrophy additionally to intraoperative risk factors (surgical trauma).

[36]
HIGH INCIDENCE OF CORONARY SINUS ANOMALIES AND IMPACT ON TRANSVENOUS LEAD PLACEMENT FOR CRT IN YOUNG PATIENTS AND THOSE WITH CONGENITAL HEART DISEASE

P. FRANGINI, C. BERUL, M. ALEXANDER, J. TRIEDMAN, A. VALENTE, E. WALSH, F. CECCHIN

CHILDREN'S HOSPITAL BOSTON, BOSTON, USA

Transvenous cardiac resynchronization therapy (CRT) in adult patients with dilated cardiomyopathy is optimal if the lead is placed in a pos-

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terolateral coronary sinus (CS) branch. In young/congenital heart disease (CHD) patients the incidence of CS anomalies and ability to place a posterolateral lead has not been described.
We sought to review CS anatomy and final left ventricular transvenous lead position in young and/or patients with CHD.
Methods Single institution retrospective review of 19 consecutive patients that underwent transvenous CRT.
Results Median age was 17.6 years (7.2 – 47). Twelve patients had CHD (3 L-TGA, 3 TOF, 2 aortic stenosis, 2 VSD and aortic coartaction, 1 D-TGA, 1 CAVC). The others had no intracardiac defect. Beside small size of branches which was appropriate for the age, 8 (42%) had "classic" CS anatomy. Abnormalities seen were: hypoplastic or poor arborized CS, 9 (47%); absent posterolateral branch,12 (63%); unroof CS, 2 (10%). Five (26%), persistent left superior vena cava (LSVC) with no identifiable posterolateral CS branch. LSVC was used as access for CS lead implantation in 2 of 5. Successful posterolateral lead placement was possible in 4 of 7 (57%) group with an identifiable posterolateral branch. In both patients with unroof CS multisite pacing was performed by adding a second RV lead. Two needed epicardial LV implantation (both with absence of branches, and one CS ostial stenosis). In one patient with hypoplastic CS, CRT was never implanted. Finally, 7 had lead insertion into the middle cardiac vein and 3 into a lateral marginal vein branch.
Conclusions Our findings showed that abnormal CS anatomy and absence of a suitable posterolateral vein for transvenous lead placement are common in young patients and those with CHD. Successful transvenous lead implantation requires an understanding of complex CS anatomy and use of specialized interventional catheterization techniques.

[37]
TACHYCARDIOMYOPATHY IN CHILDREN - IS MEDICAL TREATMENT STILL AN OPTION?

R. CIUDIN, I. GHIORGHIU, C. GINGHINA

INSTITUE OF CARDIOVASCULAR DISEASES, BUCHAREST, ROMANIA

Background Tachycardiomyopathy is a rare form of secondary cardiomyopathy to incessant tachyarrhythmias. This form of cardiomyopathy is one of the very few still - fully or partially - reverseble in children.
Material and Methods 8 children diagnosed with incessant tachyarrhythmias and tachycardiomyopathy were addmited in our pediatric cardiology department between January 2001-January 2006. Patient (pts) mean age was 9 years (3.5 and 16.7 years); there were 6 boys and 2 girls.. They represent <1% of pts addmited in our department during the analysed period. All pts were investigated clinically, 12 lead ECG, 2D/M mode and Doppler echocardiography, chest X-Ray, 24h Holter monitoring and 4 pts underwent electophysiological study. Pts were seen biannually or readdmited earlier if they had tachyarrhythmias despite treatment.
Results 2 pts were in NYHA stage 2 at admission, 2 pts in stage3 and 2 in stage IV. First ECG at admission have shown an 280 bmp supraventricular atrio-ventricular reintrant tachycardia in 1 pt, 4 pts had typical focal atrial tachycardias (3 pts from the right atrium) and 2 pts had chaotic atrial tachycardias. Radiofrequency ablation was successfull in 2 of 4 pts who underwent EP study. In all other pts tachycardia was keept under control on medical treatment. The initial left ventricular ejection fraction decreased at 34% improved to a mean of 49% in 6 months following antiarrhythmic medical treatment (amiodarone +/- betablockers) but the best recovery was seen in the 2 pts who underwent ablation for atrial foci.
Conclusions We conclude that tachycardiomyopathy secondary to incessant supraventricular tachycardias in children has as best treatment automatic focus ablation but pharmacological treatment could be a good option if ablation could not be done or it fails.

[38]
ATHEROSCLEROSIS OF THE CAROTID ARTERY AND HYPERSENSITIVE CAROTID SINUS SYNDROME IN PATIENTS WITH SSS

D. ZIVKOV-SAPONJA, V. TOPALOV, D. KOVACEVIC, Z. BUJANDRIC

INSTITUTE OF CARDIOVASCULAR DISEASES OF VOJVODINA, SREMSKA KAMENICA, SERBIA

Background It is known that sinus caroticus hypersensitivity (CSH) is recognized in up to 45% of elderly patients, especially with syncope, falls and dizziness, and it's prevalence in healthy controls is 13%. The patophysiology of CSH is unclear, but it is associated with the process of ageing, hypertension and ischaemic heart disease. According to the present hypothesis that CHS is result of upregulation of brainstem postsinaptic alpha-2 adrenoreceptors, we postulated a hypothesis that the atherosclerotic process in the carotid artery (CA) may be related to CHS.
The aim of the study was to examine if there is any relationship between the groups with and without athersosclerotic disease of carotid arteries.
Patients and methods We studied a total of 95 patients, divided into two groups afte they underwent color duplex scan of carotid artery. Group A (the study group): 55 consecutive patients (30 male, 25 female), age 54.4±8.5 with different localizations of atherosclerotic plaque (internal carotid artery, bifurcation and/or bulb of common carotid artery. Group B (the control subjects) consisted of 45 patients, age 57.4±9.5 (22 male, 23 female), without any visible atherosclerotic process in CA (intiima-media thickness less than 1.0 mm). Patients with the "unstable plaque" and/or diameter of stenosis of more than 60% vere excluded.
Carotid sinus massage methodology was performed according to the Newcastle Protocol (firm massage of both sides in carotid sinus region, first in the right, than in the left, in supine and upright position). Blood pressure was contiuously measured and ECG 25 mm/sec monitored.

Cardio-inhibitory type	Vasodepresor type				Mixed type		Syncope		
Study group (A)		4	7*	3	6*	4	none*	5	5*
Control group (C)	2	4*	2	4*	4	2*	3	none*	

*) Upright position

Conclusions The main conclusions were:
– There was a higher, positive response in group A (with atherosclerotic disesase of CA);
– CSH is misdiagnosed in 16 pts (45.85% in the study group A, and 14.40% in control subjects).

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[39]
VALUE OF THE SPIROERGOMETRICAL TESTS IN PATIENTS WITH SSS AND CHRONOTROPIC INCOMPETENCE QUALIFIED FOR THE 2-SENSOR RATE RESPONSIVE PACEMAKER IMPLANTATION

E. PILAT, R. MLYNARSKI, W. KARGUL

ELECTROCARDIOLOGY DEPARTMENT, MEDICAL UNIVERSITY OF SILESIA, KATOWICE, POLAND

There is no research evaluating the characteristic features of patients for whom double sensor rate response pacemakers can have advantages – results of spiroergometrical tests can support process of qualification.

Purpose to evaluate value of the spiroergometrical tests for patients qualified for implantation of double-sensor rate response pacemakers.

Methods 40 pts. with sick sinus syndrome and chronotropic incompetence were included in the study. In the examined group (20 pts.), double sensor (accelerometer and minute-ventilation) pacemakers (Guidant, Pulsar Max DR) were implanted. After randomization, patients were placed into one of the two groups: 1 - only the accelerometer sensor was activated; 2 - both sensors were activated. After the 3-month follow-up, the initial spiroergometrical test (STest) was performed, after which the patients were placed in the opposite group for further 3 months. Finally, the second STests were performed. All tests were performed under the same conditions on a Jaeger treadmill ergometer (modified Bruce protocol, maximal test).

Result are presented as relative differences between the group. Minus value represent group without improvement. Predictive factors of the improvement of physical activity are: ventilation in the rest 7,27% (p=0,70); oxygen uptake in the rest 22,88% (p=0,21); minute volume expired CO2 1,21% (p=0,64). Predictive factors of lack of the improvement of physical activity are: time of exercise -20,64% (p=0,07); maximum load -27,53% (p=0,32); maximal ventilation -14,88% (p=0,47); maximal oxygen uptake -15,44% (p=0,64); rate of elimination of CO2 -20,88% (p=0,70). None of the presented results were statistically significant. A positive tendency for the double-sensor group was marked for women, age >65 years, O2 consumption at rest >5,83 L/kg/min and BMI >28.

Conclusions Spiroergometrical tests can support process of qualification and help to chose group of predictors for double sensor rate-response pacing.

[40]
CHANGES OF ELECTROCARDIOGRAPHY AND LATE POTENTIAL AFTER PILSICAINIDE AND ISOPROTERENOL ADMINISTRATION IN PATIENTS WITH BRUGADA SYNDROME

M. TAGAWA[1], M. CHINUSHI[2], H. UCHIYAMA[1], H. FURUSHIMA[2], Y. AIZAWA[2]

[1]DEPARTMENT OF CARDIOLOGY, NAGAOKA CHUO GENERAL HOSPITAL, NAGAOKA, JAPAN; [2]FIRST DEPARTMENT OF INTERNAL MEDICINE, NIIGATA GRADUATE UNIVERSITY OF MEDICINE, NIIGATA, JAPAN

Purpose We evaluated the effect of pilisicanide and isoproterenol (ISP) in patients with Brugada syndrome with special reference to twelve-lead electrocardiography (ECG) and single-average electrocardiograms (SAECG).

Methods The subjects included 11 Brugada syndrome patients (all men, mean age 55±16 years). ST levels in lead V2 and the parameters of SAECG (f-QRS duration, LAS40, RMS40) were measured after administration of pilsicainide followed by continuous intravenous administration of ISP (0.01-0.02 mg/hr) in addition.

Results Before administration of pilsicainide, the mean ST-elevation in lead V2 was 2.2±1.2 mm and the late potential (LP) was positive in 8 of eleven patients. In all patients, ECG converted to the coved-type ST and ST-segment elevation was accentuated in leads V1 to V3 (V2: 4.7±1.3 mm) by intravenous administration of pilsicainide (mean dose 46.5±15.6 mg). Both f-QRS duration and LAS40 increased and RMS40 decreased significantly after administration of pilsicanide (f-QRS: 123.5±6.8 to 144.2±19.1 ms, LAS40: 37.1±4.4 to 52.5±11.2 ms, RMS40: 17.7±7.7 to 8.9±4.1 μV). LP was positive in all patients after administration of pilsicainide. After continuous administration of ISP, ST-segmental elevation decreased significantly (V2: 1.2±1.1 mm): not only after administration of pilisicanide but also before administration of pilsicainide. Though both f-QRS duration and LAS40 decreased and RMS40 increased significantly after continuous administration of ISP (f-QRS: 127.8±16.5 ms, LAS40: 38.7±5.9 ms, RMS40: 17.6±9.3 μV), the parameters of SAECG after ISP did not significantly change before pilsicanide and LP remained positive in 8 of those patients.

Conclusion Administration of plisicanide augmented the Brugada ECG pattern and the criteria of late potential in SAECG was fulfilled in all patients. Continuous administration of ISP decreased ST-segmental elevation, but the late potential remained positive in many of our patients. These results suggested the presence of a conduction delay in the ventricle and the mechanism of the sequential changes in SAECG is to be studied in Brugada syndrome.

[41]
LOCATION OF GENERATING TYPE-1 ELECTROCARDIOGRAM IN BRUGADA SYNDROME: COMPARISON BETWEEN LEAD POSITION AND ANATOMICAL LOCATION OF RIGHT VENTRICULAR OUTFLOW TRACT

S. NAGASE, S. HIRAMATSU, N. NISHII, K. MIYAJI, M. MURAKAMI, T. TADA, D. MIURA, T. OKA, K. NAKAMURA, K. KUSANO, T. OHE

OKAYAMA UNIVERSITY GRADUATE SCHOOL OF MEDICINE, DENTISTRY AND PHARMACEUTICAL SCIENCES, OKAYAMA, JAPAN

Introduction Recording type-1 ECG in right precordial leads in the presence or absence of a sodium channel blocker is a diagnostic criterion in Brugada syndrome (BrS). It was also suggested that right ventricular outflow tract (RVOT) is the arrhythmogenic substrate in BrS. However, we occasionally observed type-1 ECG only in the third intercostal space (3ics), not standard fourth intercostal space (4ics). Accordingly, we examined the relationship between the position of ECG leads and location of RVOT.

Methods Total 38 BrS patients were examined in this study. Anatomical location of the RVOT was determined under fluoroscopic image with right ventriculography. ECG was also recorded at the 3 ics in leads V1 and V2 in addition to the standard V1 and V2 at the 4 ics with fluoroscopically visible electrodes. A pure sodium channel blocker, pilsicainide, was administered in all patients without manifesting type-1 ECG under baseline conditions. Relationships between anatomical location and the position of ECG leads manifesting type-1 were examined.

ResultsType-1 ECG was recorded in all patients with pilsicainide administration. The location of RVOT corresponded with lead V1 and V2 at the 4 ics in 6 patients and at the 3 ics in 32 patients. In 5 out of 6 patients (83.3%) corresponding RVOT with 4 ics, type-1 ECG was recorded at the 4 ics. However, in 27 out of 32 patients (84.4%) corresponding RVOT with 3 ics, type-1 ECG was recorded only at the 3 ics. Furthermore, in 7 out of 12 symptomatic patients (58.3%) with documented ventricular fibrillation or syncope, type-1 ECG was not recorded at the 4 ics, however, could be detected at the 3ics without pilsicainide administration.

Conclusions Type-1 ECG is predominantly caused at the RVOT, and the relationship between the position of ECG lead and the RVOT is

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variable. Recording ECG at the 3 ics in addition to the standard 4 ics in the right precordial leads is convincing in diagnosis of BrS.

[42]
LONG-TERM FOLLOW-UP OF IMPLANTABLE CARDIOVERTER DEFIBRILLATOR IN PATIENTS WITH BRUGADA SYNDROME

V. ENES, M. FONSECA, R. LIMA, D. CAEIRO, P. MATEUS, L. ADAO, H. GONÇALVES, J. PRIMO, R. ROSAS, L. SIMOES, V. RIBEIRO

CENTRO HOSPITALAR VILA NOVA, GAIA VNG, PORTUGAL

Purpose The Brugada syndrome is an autosomal dominant disease with incomplete penetrance that can cause sudden cardiac death or life-threatening ventricular arrhythmias, especially in younger men. The recommended treatment is the implantation of cardioverter defibrillator (ICD). The purpose of this work is to evaluate the characteristics and prognosis of a population of patients with Brugada syndrome treated with ICD.
Methods Analysis of ten patients (nine men and a woman) with Brugada Syndrome who underwent electrophysiological study (EPS) with subsequent implantation of ICD, between June of 1999 and December of 2006.
Results The mean age was 47±18 years. These patients didn't present structural heart disease in the transthoracic echocardiogram.
Three had family history of sudden cardiac death.
Four patients presented history of repeated syncopal episodes, without documented ventricular arrhythmias during these episodes. In other the first manifestation of this syndrome was cardiorespiratory arrest.
In basal electrocardiogram five patients had type I pattern and the other five had type II pattern (test with flecainide positive).
EPS was performed in all patients, in one patient no ventricular arrhythmias are inducible, and in seven patients polymorphic ventricular tachycardia (one degenerated in ventricular fibrillation) was induced. In two patients was induced monomorphic ventricular tachycardia. In nine patients was implanted a single chamber ICD and in other a bicameral ICD was implanted.
The mean time of follow-up was four years. During this period, occurred events just in one patient, in the female patient, that presented three episodes of polymorphic ventricular tachycardia resolved with appropriate shock therapy. The mortality rate was 0%.
Conclusion Although the risk stratification for the Brugada syndrome still incomplete, the available data recommend prophylactic implantation of an ICD for prevention of sudden cardiac death.

[43]
FUSION OF ELECTROANATOMIC MAPS AND MULTIDETECTOR COMPUTED TOMOGRAPHY IMAGES FOR VALIDATION OF LEFT ATRIUM CATHETER ABLATION POINTS IN ATRIAL FIBRILLATION PATIENTS

M. DEL GRECO[1], A. CRISTOFORETTI[2], M. MARINI[1], C. GIOVANELLI[1], F. RAVELLI[2], M. CENTONZE[3], G. NOLLO[2], M. DISERTORI[1]

[1]DEPARTMENT OF CARDIOLOGY, S. CHIARA HOSPITAL, TRENTO, ITALY; [2]DEPARTMENT OF PHYSICS, UNIVERSITY OF TRENTO, TRENTO, ITALY; [3]DEPARTMENT OF RADIOLOGY, S. CHIARA HOSPITAL, TRENTO, ITALY

The correlation between electrical patterns and anatomic structure of the atria remains an important challenge for successful radiofrequency ablation of atrial fibrillation (AF). Aims of this study were: a) the 3D anatomic reconstruction of left atrium (LA) and pulmonary veins (PVs) and its fusion with LA electrical map (CARTO); b) validation of the real positions of the PVs ablation points (APs) on the fusion maps. Methods: Eighteen pts (61 years) affected by AF underwent circumferential PVs ablation. In 6 pts multidetector 16 slices computed tomography (MDCT) was performed after ablation and in 12 pts before it. A marker-controlled "watershed segmentation" was developed for LA reconstruction. Electroanatomic maps (CARTO) were registered on the LA inner surface in all pts. minimizing the residual error by a stochastic relaxation approach. This custom made algorithm allows registration and fusion of electroanatomic maps with MDCT images. On the "fusion maps", we count offline the APs in the LA body, on the atrium-vein (A-V) junction, inside the antrum and in the PVs. Results: 54% of the APs number was counted in the LA body, 24% on the A-V junction, 14% inside the antrum and 8% in the PVs. The APs distribution inside the PVs was: 39% inside the left superior (LSPV), 34% inside the right inferior, 17% inside the right superior and 10% inside the left inferior. The area between LSPV and left atrial appendage showed the higher number of APs. Expect one, all the pts with APs inside the PVs did not perform MDCT before the procedure. Conclusions: Fusion maps allow to validate the real position of the APs. During AF ablation 8% of the APs were located inside the PVs. The availability of MDCT of the LA and PVs before the ablation procedure reduces the number of APs inside the PVs.

[44]
IMAGE REGISTRATION IN THE CARTOMERGE TECHNIQUE: SEARCHING FOR A STANDARDIZATION

R. DE LUCIA, M. BONGIORNI, G. ARENA, E. SOLDATI, F. ODOGUARDI, G. ZUCCHELLI, A. DI CORI, L. SEGRETI, G. SOLARINO, M. MARZILLI

CARDIAC AND THORACIC DEPARTMENT, AZIENDA OSPEDALIERO-UNIVERSITARIA PISANA AND UNIVERSITY OF PISA, PISA, ITALY

Purpose The image integrated 3D electroanatomic mapping (EAM) systems have been recently developed and at the moment there are no standard protocols. We aimed to standardize the surface registration (SR) by checking the optimal localizations of endocardial recordings and the minimum total number of these recordings needed to achieve a reliable navigation.
Methods The CartoMerge (Biosense Webster) system was used in 21 procedures in 20 patients affected by paroxysmal or persistent atrial fibrillation (AF). MRI data were imported in this system. A point situated at the junction of the left superior pulmonary vein (PV) with the left atrium (LA) was used as landmark for SR. Then we acquired 19 endocardial sites at predefinite areas considering entire LA volume while SR was ongoing. Optimal alignment was considered when no EAM point was located >5 mm inside/outside the MRI reconstruction's surface, and mean surface-to-point distance was <2 mm. Reliability of navigation into PVs was finally tested.
Results SR required a mean time of 10 min (range 9-13) with an average fluoroscopy time of 7 min. Reliable navigation into PVs guided by CartoMerge was obtained as follows: left superior PV 100%, left inferior PV 93.75%, right superior PV 100%, right inferior PV 87.5%. A common ostium of left PVs was observed in 20% of patients, while early branching was documented in 18.5% of PVs. Owing to the technique's reliability, it was possible to perform proximal antrum ablation in all these cases. Ablation mean fluoroscopy time was 13 min (range 9-18).
Conclusions The technique of acquiring endocardial sites at predefinite areas showed to be quickly and reliable for the navigation into the LA. The image-integrated CartoMerge system enables to reduce remarkably fluoroscopy time, and to avoid complications as PVs stenosis allowing tailored RF ablation to proximal site of PVs even in complex anatomic variants.

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[45]
REMIFENTANIL VERSUS PROPOFOL DURING RADIOFREQUENCY ABLATION OF PULMONARY VEINS. ANALGESIA OR SEDATION?

M. LAGROTTA[1], F. CANTÙ[1], S. GIOVANNONI[2], F. LORINI[1], P. DE FILIPPO[1]

[1]OSPEDALI RIUNITI DI BERGAMO, BERGAMO, ITALY; [2]BARD S.P.A, ITALY

Background Radiofrequency ablation around pulmonary veins is painful. During this procedure analgesia and sedation are required for the thermal injury provoked by the device. The aim of this study is to compare the analgesic and sedative effects of propofol with remifentanil infusion during radiofrequency catheter ablation.
Methods This study has been approved by the Ethic Committee of Ospedali Riuniti di Bergamo. Six patients (4 men, 2 female; average age 62,5 yrs) undergoing radiofrequency ablation with BARD® HD MESH Ablator for atrial fibrillation (3 paroxysmal, 3 persistent) were recruited and consent form obtained. This catheter performs a simultaneous, curvilinear and pulsed RF ablation. Each patient received oral midazolam (70 micrograms/Kg) as premedication 30 minutes before procedure. Then every patient received remifentanil (0.0125-0.05 micrograms/Kg/min) during ablation of left pulmonary veins and propofol (1-2 mg/Kg/hr) during ablation of right pulmonary veins. Pain measurement with Visual Analogic Scale (VAS), sedation evaluation with sedation (SED) score and movement evaluation with numerical score have been performed at the end of each drug infusion. Non invasive arterial pressure, end-tidal CO2 and SatO2 were monitored throughout the procedure.
Results One patient had a vagal reflex that required orotracheal intubation and the rest of the procedure was continued under general anesthesia; for this reason the patient was excluded from the study. During remifentanil infusion VAS was 2.8±0.7 vs 8.0±0.6 ($p<0.001$), SED score 1.2±0.4 vs 2.8±0.4 ($p<0.001$), and movement score 0.0±0.0 vs 2.1±1.2 ($p=0.01$) compared to propofol infusion. All the procedures were aneventful and lasted between 148 and 240 minutes with ablation time between 16 and 43 minutes.
Conclusion remifentanil infusion induced greater analgesia with less sedation compared to propofol. Also during remifentanil infusion patients movement scale were lower without interfering with the electrophysiological procedure.

[46]
NOVEL APPROACH TO DUAL CHAMBER PACING AND DEFIBRILLATION AFTER TRICUSPID VALVE REPLACEMENT

J. LOPEZ

TEXAS HEART INSTITUTE/BAYLOR COLLEGE OF MEDICINE, HOUSTON, USA

In the presence of prostetic tricuspid valves, defibrillating RV endocardial leads are contraindicated since could result in valve damage, failure and death. The alternative has been thoracotomy, with epicardial leads for pacing and sensing, defibrillating patches or one patch and SVC coil with significant higher morbidity and mortality. This is the first report of atrial -ventricular pacing and cardiac defibrillation obtained by percutaneous approachin with no endocardial leads in the RV.
Case report: 43 yo woman with tetralogy of Fallot and surgical repair at age 7. At 38 presented with CHF. Had 2 episodes of syncope,inducible VT and RF ablation at 39. At 40 underwent succesful correction of RVOT aneurism and pulmonary, aortic and tricuspid valve replacement. In 2007 required MVR for posterior chordal rupture and flail segment. Surgery was complicated with significant sinus bradycardia, complete AV block, 3 episodes of monomorphic VT. On the 4th day rather than a 4th thoracotomy recomended attempt to transvenos approach.
Over guide-wire, a bipolar lead (Model 4194; Medtronic) was placed in the lateral vein,excellent pacing and sensing threshold and no phrenic stimulation were documented. With a deflectable delivery sheath a bipolar lead (Model 4076; Medtronic) was placed in the Bachmann's bundle region for atrial septal pacing. A defibrillating coil lead (Model 6937; Medtronic) was delivered into the CS. Under local anesthesia and sedation a retromammary pocket was formed , the leads tunneled and connected to a Virtuoso DR pulse generator (Medtronic). VF was induced and 2 different cofigurations failed to terminate arrhythmia requiring external rescue shocks. The midle cardiac vein was catheterized and the coil lead was delivered through a sheath. In this configuration 20 Jsuccesfully terminated VF twice (43 Ohms impedance). This case shows that ventricular pacing, VF sensing and defibrillation is feasible by transvenous approach with no leads in the RV.

[47]
INCIDENCE OF AV BLOCKS IN THE FOLLOW-UP OF DUAL-CHAMBER PACEMAKER PATIENTS: DO WE REALLY KNOW OUR PATIENTS AT IMPLANT TIME?

G. MANTOVANI[1], R. BANA[2], F. FERRARI[3], A. VICENTINI[4], L. FRABETTI[5], A. PEZZOTTA[6], J. DAVY[7]

[1]OSPEDALE CIVILE, DESIO (MI), ITALY; [2]OSPEDALE CIVILE, GARBAGNATE (MI), ITALY; [3]OSPEDALE CIVILE, RHO (MI), ITALY; [4]CDC PEDERZOLI, PESCHIERA DEL GARDA (VR), ITALY; [5]POLICLINICO S. ORSOLA-MALPIGHI, BOLOGNA, ITALY; [6]SORIN GROUP ITALIA SRL, MILANO, ITALY; [7]CHRU, MONTPELLIER, FRANCE

'SafeR' is a pacing mode designed to reduce the unnecessary % of ventricular pacing, operating in AAI mode and switching to DDD whenever atrioventricular blocks (AVBs) occur. The aim of this analysis was to report the incidence of AVBs on a long-term follow-up (f-up) in the 'SAVE-R' study pts: first implant of pacemaker (PM) due to sinus node dysfunction (SND) and/or paroxysmal AVB (p-AVB).
Methods We considered 396 pts (51% M, 73±11 y) implanted with a Symphony DR/D PM (SORIN Group), all programmed in SafeR mode at inclusion time (setting maintained along the study). PM memories were retrieived at 1-month (1 M), 3 M and 1-year f-up. Pacing indications (% of pts): SND 42%, p-AVB 38%, brady-tachy syndrome (BTS) 20%. Available diagnostic files: 340 at 1 M, 145 at 3 M, 102 at 1-year f-up.
Results Incidence of AVBs (% of pts with at least 1 switch) at 1 M, 3 M, 1-year f-ups: 66%, 83%, 83% respectively. According to the PM criteria to classify AVBs, the majority of AVBs were of II degree (62%, 62%, 51% at 1M, 3M, 1-year respectively).
At 1 M f-up, 23% of p-AVB pts had no switches at all, whereas 44%/37% of BTS/SND pts respectively had reported switches. Number of switches vs pacing indication at implant (mean±std dev, median): SND 169±1065, 2; BTS 105±343, 1; p-AVB 311±576, 26.
Conclusions When SafeR is programmed in a population of SND/p-AVB pts, the incidence of AVBs is higher on a long-term f-up basis than 1M after implant. More than half of switches are due to intermittent AV conduction ('IId. AVB' classification by PM). At 1M f-up, p-AVB pts had a relevant impact on the mean of 'AAI to DDD' switches. Nonetheless, SafeR mode prevents unnecessary Vp in 23% of 'allegedly p-AVB' pts, and assures a back-up V pacing in case of unexpected AVBs in 44%/37% of SBT/SND pts respectively.

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[48]
EARLY MOBILIZATION AFTER PACEMAKER IMPLANTATION: 4 YEARS EXPERIENCE

G. MIRACAPILLO, A. COSTOLI, L. ADDONISIO, M. BRESCHI, L. GEMIGNANI, S. SEVERI

U.O. CARDIOLOGIA, GROSSETO, ITALY

Background No international guidelines indicate how much time a patient should stay in bed after pacemaker (PM) implantation and many different protocol still exist. Previous studies of our group evidenced that an early mobilization protocol is feasible and safe. The 4 years experience of our centre is described in this report.
Methods A 3 hrs immobilization protocol after single or dual chamber PM implantation has been applied in our Institute in the period March 2003 – February 2007 to 566 consecutive pts (mean age 78±8 yrs, range 30-99, males 54%).
Immobilized chronicle pts, ICD, biventricular and active fixation leads were excluded.
After the implant procedure an elastic bandage was applied to the ipsilateral shoulder for 24 hours. Twenty-four hours since implantation, a PA and LL projections chest X-ray was performed in order to verify the exact position of the leads. Clinical and electronic controls, including measuring of lead impedance, stimulation and sensing thresholds, were performed before discharge, 1 month later and then every one year.
End-points were considered the displacement of a lead at the X-ray, high pacing thresholds at the electronic controls (>2.5 V/0.4 ms), sensing defects not corrigible by reprogramming and clinical complications of the pocket formation like haematoma, infections or subclavian vein thrombosis.
Results In a four years time, 566 implanted PM followed the described protocol (AAIR 0.7%, DDDR 47.5%, VDD 22.7%, VVIR 29.1%).
The complications were: 2 haematoma (0.3%), 13 leads displacements that required repositioning (2.2%), 1 subclavian vein thrombosis (0.1%), 1 local infection (0.1%, in a patient affected by non Hodgkin lymphoma) and 1 local dehiscence of a stitch (0.1%), both surgically and successfully repaired.
Conclusions According to previous reports, early mobilization after pacemaker implantation is feasible, safe, time sparing, cost saving and very appreciated by pts.

[49]
PERFORMANCE EVALUATION OF PERMANENT CONVENTIONAL VERSUS BIFOCAL STIMULATION IN PERMANENT ATRIAL FIBRILLATION AND ATRIO-VENTRICULAR BLOCK PATIENTS USING PEAK ENDOCARDIAL ACCELERATION (PEA)

L. ZAMPARELLI[1], A. MARTINIELLO[1], P. CASO[1], R. CALABRÒ[1], A. BONCOMPAGNI[2], P. SCOGNAMIGLIO[2]

[1]A.O. MONALDI, NAPOLI, ITALY; [2]SORIN GROUP, MILANO, ITALY

Introduction Permanent atrial fibrillation (PAF) associated with permanent high-degree AV block is one of the current most common ACCAHA indications for VVIR(R) pacemaker implant, with the goal of restore physiological rhythm.
In patients with PAF and high-degree AV block, atrial arrhythmia plays an important role in worsening haemodynamic condition, making pacing configuration optimisation mandatory. For these patients with medium-high haemodynamic damage for the lack of atrial contribution to ventricular refilling, it's still not known which is the optimal pacing configuration. Moreover, the detrimental effect due to RV stimulation acts in a faster way.
One of the more reliable contractility index is LV dP/dt. This index can be evaluated in PM implanted patients through a sensor imbedded in RV catheter.
Aim of the study The aim of this pilot study is to demonstrate the haemodynamic advantages of bifocal stimulation versus conventional VVIRR stimulation. Standard echocardiography and TDI will join PEA data to better understand resynchronisation effect of bifocal stimulation.
For the study purpose, each patients will be tested to three different pacing configuration: conventional VVIR, septal single RV catheter VVIR, bifocal configuration.
Study design This is a pilot, single-centre, longitudinal, prospectic, 1 arm, 5 months duration study.
Patient require: PAF, high-degree AV block, implantation of a PEA provided PM.
All will undergone 4 follow-up, the first after PM implantation or immediately before hospital dismission, the second after 1 month, the third and fourth after 3 and 5 months.
First 30 days are only observational for system stabilisation and PM will be programmed in VVIR configuration.
In each follow-up (implant or baseline, standard VVIR, septal VVIR and bifocal stimulation) will be measured: PEA (mean of the last 24 hours), LVEF, ventricular dissynchrony through TDI.
Following the first 30 days in conventional VVIR, patients will be stimulated from the septum for 2 and after that for 2 months in bifocal stimulation.

[50]
MULTISITE ATRIAL PACING INCORPORATING BACHMANN'S BUNDLE REGION RESULTS IN IMPROVEMENT IN ATRIAL MECHANICAL SYNCHRONY

E. LEWICKA-NOWAK[1], A. DABROWSKA-KUGACKA[1], A. KUTARSKI[2], P. ZAGOZDZON[3], G. RACZAK[1]

[1]DEPARTMENT OF CARDIOLOGY AND ELECTROTHERAPY MEDICAL, UNIVERSITY OF GDANSK, GDANSK, POLAND; [2]DEPARTMENT OF CARDIOLOGY, MEDICAL UNIVERSITY OF LUBLIN, LUBLIN, POLAND; [3]DEPARTMENT OF HYGIENE AND EPIDEMIOLOGY, MEDICAL UNIVERSITY OF GDANSK, GDANSK, POLAND

Multisite atrial pacing has been introduced for preventing the recurrence of atrial fibrillation. However, selection of optimal atrial pacing sites necessary to obtain the most beneficial antiarrhythmic effect is an unresolved issue, and data on the hemodynamic effects of multisite atrial pacing is limited and controversial.
Aim of the study The aim of the study was to assess effects of right atrial (RA) lead placement at the Bachmann's bundle (BB) area on atrial mechanical dyssynchrony in patients treated with multisite atrial pacing, in comparison do conventional RA appendage (RAA) site. In all patients the second atrial pacing lead was implanted in the coronary sinus (CS).
Methods In 57 patients with multisite atrial pacing pulsed tissue Doppler examination was performed to assess the interatrial (InterA), intra-left-atrial (IntraLA) and intra-right-atrial (IntraRA) mechanical dyssynchrony. The interval from the pacing spike to the beginning of the local A-wave was recorded in the lateral, inferior, anterior LA wall, interatrial septum and lateral RA wall.
Results There were no significant differences between two groups other than pacing duration: 2.8±1.3 years in the RAA vs. 1.3±0.5 years in the BB group ($p<0.01$). Comparing RAA+CS and BB+CS pacing configurations according to atrial mechanical dyssynchrony: InterA 20±13 ms (2 – 48) vs 14±9 ms (0 – 33) p=0.08; Inter-LA 28±13 ms (6 – 57) vs 20±10 ms (5 – 58) p=0.01; Inter-RA 15±9 (2 – 34) ms vs 13±12 ms (0 – 49) p=0.5.
Conclusions Implantation of the right atrial lead at the Bachmann's bundle region improves regional wall motion synchrony within the left atrium in patients with multisite atrial pacing, when compared to conventional right atrial appendage site. A tendency to improve-

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ment in the synchronicity of interatrial contraction was also observed.

[51]
INDUCED HEART RATE TURBULENCE AND BAROREFLEX SENSITIVITY AFTER PERCUTANEOUS CORONARY INTERVENTION IN PATIENTS WITH CORONARY ARTERY DISEASE

I. MAPPANGARA, M. MUNAWAR, I. FIRDAUS, M. SYAIFUR, R. PRAKOSO, R. SARAGIH, C. TRITJAHJONO, Y. YUNIADI, G. HARIMURTI, O. RACHMAN

NATIONAL CARDIOVASCULAR CENTER HARAPAN KITA, JAKARTA, INDONESIA

Background Sudden cardiac death is common in patients with coronary artery disease (CAD. Heart rate turbulence (HRT) and baroreflex sensitivity (BRS) as a part of autonomic nervous system activity, play an important role in the development of sudden cardiac death. Revascularization by percutaneous coronary intervention might improve the autonomic alteration.
Objectives To investigate whether revascularisation by PCI give improvement of the autonomic nervous system activity reflected by HRT and BRS.
Methods This is a before and after study of 22 patients with CAD, who underwent percutaneous coronary intervention in National Cardiac Centre Harapan Kita, Jakarta. We induced a single ventricular extra systole and administered 300 micro grams of nitroglycerine intravenously for HRT and BRS measurement before and after PCI.
Results There was 22 patients enrolled, male patients was dominant (18 patients) with mean age 57,7±9,5 years. Complete revascularization were achieved in 81.8% with TIMI flow 3 in 90,9% (20 patients). Value of two parameters HRT changes after revascularization. There were no significant changes after PCI in TO value (TO value before PCI was -1,11±4,23% to -1,68±3,42% after PCI, p=0,527) but significant changes occurred in TS value after PCI. (TS value before PCI was 8,56±8,20 msec/RRI to 15,76±15,57 msec/RRI after PCI, p=0,046). There is the tendency for HRT category improvement after PCI. BRS showed no differences before and after PCI in patients with CAD (BRS before PCI was changes from 2,54±3,57 msec/mmHg to 1,88±1,62 msec/mmHg).
Conclusions There was autonomic respons resolution tendency in patient with CAD after revascularization reflected by HRT parameter but not in BRS.
Keywords Heart rate turbulence, baroreflex sensitivity, percutaneous coronary intervention

[52]
MINIMIZATION OF MRI-INDUCED HEATING OF DISTAL TIPS IN IMPLANTED LEAD SYSTEMS

W. DABNEY, R. STEVENSON, C. FRYSZ

GREATBATCH, INC CLARENCE, USA

Purpose There is significant patient risk associated with MRI scanning of patients with implanted pacemakers and defibrillators. The most significant risk to the patient is represented by the potential for heating of the distal tip of the lead system. This heating can potentially cause irreversible changes in the efficacy of device functionality; in worst cases, in can cause localized ablation of myocardial tissue, loss of pacing capture, and myocardial perforation. This issue is, in part, a function of the MRI scanner and scanner protocol. This study builds on previous work to compare multiple scanner types, their effects on in vitro heating, and the global effectiveness of potential heating solutions.
Methods Control and test pacing leads were prepared for in vitro testing, including the use of saline and gel media. 1.5T and 3.0T MRI scanners, with various scanning protocols, were used. X- and z-position within the bore were varied to represent various heating conditions. Fiber optic temperature sensors were attached to the lead, and temperature increases with respect to elapsed scanning time were measured. Comparisons between control and test leads were made, and the results were compared against previously reported data and theoretical models.
Results Heating measurements of the control leads indicated a broad range of temperature increases, with results as high as 80C in some 3.0T configurations. Test leads showed as much as 95% reduction in temperature increases for corresponding configurations. Furthermore, the performance of the test leads is in agreement with previously established theoretical models.
Conclusions Distal tip heating can have significant effects on the tissue interface, although predicting exact results can be difficult. However, it is possible to minimize the effects of this heating by making appropriate changes to the designs of lead systems. This can help to minimize some of the adverse interactions between MRI and implanted medical devices.

[53]
TRANSVENOUS REMOVAL OF NON-INFECTED PACING AND DEFIBRILLATING LEADS: RESULTS AND COMPLICATIONS IN A SINGLE CENTER EXPERIENCE

L. SEGRETI, M. BONGIORNI, E. SOLDATI, G. ARENA, G. ZUCCHELLI, A. DI CORI, R. DE LUCIA, G. SOLARINO, M. MARZILLI

CARDIAC AND THORACIC DEPARTMENT, AZIENDA OSPEDALIERO-UNIVARSITARIA PISANA AND UNIVERSITY OF PISA, PISA, ITALY

Background Tranvenous Lead Removal (TLR) has historically been reserved for patients with implanted pacemakers and/or ICDs with infection. Today, due to the effectiveness and safety of TLR, indications could be expanded to include patients with complex device systems and/or non-functional leads. In absence of infection, however, indications to TLR are still controversial. Aim of this study is to evaluate results and complication in TLR of non-infected pacing (PL) and defibrillating (DL) leads.
Materials and Methods Since January 1997 to June 2007, we managed 1193 patients with 2065 leads. Among these, 277 patients (182 men, mean age 56.7 years, range 8-92) had 339 non-infected leads (mean pacing period: 56.14 months, range 1-280). Indications to TLR were class I in 21% (Ib-7%, Ic-2%, Id-12%) and class II in 79% (IId-10%, IIf-1%, IIg-68%) of the leads. PL were 273 (150 ventricular, 104 atrial and 19 coronary sinus leads) and DL 66 (63 ventricular and 3 superior vena cava leads); 19 leads were free-floating. We performed mechanical dilation using the Cook Vascular (Leechburg PA, USA) extraction kit and, if necessary, other intravascular tools (Catchers and Lassos, Osypka, Grentzig-Whylen, G); a Jugular Approach through the internal jugular vein was performed in case of free-floating or difficult exposed leads.
Results Among 339 leads, 330 leads (264 PL, all the 66 DL) were completely removed (97.35%), 5 (1.47%) partially removed, 3 (0.88%) not removed; in one case (free-floating lead) the technique was not applicable (0.30%). Only 1 major complications occurred (0.36%): non-fatal cardiac tamponade.
Conclusions Our experience shows that non-infected leads can be effectively removed with low incidence of complications. Our results suggest that in patients with class II indication to TLR, the extraction benefits overcome the risks of lead abandonment.

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[54]
LEARNING CURVE IN EXTRACTION OF PACEMAKER AND ICD LEADS

P. GOLZIO[1], M. VINCI[1], C. COMOGLIO[2], M. RINALDI[2], G. TREVI[1], M. BONGIORNI[2]

[1]CARDIOLOGIA UNIVERSITARIA, DIPARTIMENTO DI MEDICINA INTERNA, UNIVERSITÀ DI TORINO, TORINO, ITALY; [2]CARDIOCHIRURGIA UNIVERSITARIA, DIPARTIMENTO DI DISCIPLINE CHIRURGICHE, UNIVERSITÀ DI TORINO, TORINO, ITALY; [3]ARITMOLOGIA INTERVENTISTICA, DIPARTIMENTO CARDIO-TORACICO, UNIVERSITÀ DI PISA, PISA, ITALY

Purpose As we started PM and ICD lead explants only recently, we believed it was appropriate to proceed with a quality assessment of the procedures carried out at our Centre, comparing extraction outcomes in the first six months and after.

Materials and Methods Between May 2003 and June 2007, at our Centre, 101 leads were extracted from 54 patients (37 males, age 26-85 years, mean 70.9).

Results While comparing the first six months and the following ones, as for continuous variables, no significant differences were detected for patients' age (72.3 vs 70.7 years old), number of explanted leads per patient (2.3 vs 2.2), number of reparative operations prior to extraction (1.4 vs 1.5), manual traction time (58s vs 56s) or number of required sheaths per lead (2.0 vs 2.5). Differences found in other variables were instead statistically significant: time from previous implant (15.7 vs 54.3 months, p=0.022), operating room time (2h:12m vs 4h:13m, p=0.000), procedure time (0h:56m vs 2h:03m, p=0.011), lead mobilization time (0h:19m vs 0h:50m, p=0.001), extraction time (0h:07m vs 0h:29m, p=0.011), dilation time (0h:01m vs 0h:22m, p=0.004) and fluoroscopy time (0h:05m vs 0h:15m, p=0.030). Considering nominal variables, values such as patient sex, Referring Centre, type of venous access, lead characteristics, operative results, acute and chronic complications did not show significant differences. On the contrary, we found significant differences for other variables: need for temporary PM after procedure (20 vs 98.4%, chi square 0.000), drugs administration (0 vs 25.8%, p=0.000), effectiveness of traction alone (80 vs 48.4%, 0.037).

Conclusions In the first six months, procedural difficulty was lesser, for a priori selection of patients explanted. However, the comparison between the first six months and the following months returned positive results, both in terms of operating success and limited number of procedural complications.

[55]
SURGICAL EXTRACTION OF INFECTED CARDIAC RESYNCHRONIZATION THERAPY SYSTEM WITH CONCOMITANT IMPLANTATION OF A NEW SYSTEM WITH THE USE OF EPICARDIAL LEADS

J. BIS[1], K. GOSCINSKA-BIS[1], M. KREJCA[1], E. ZINKA[2], J. SKARYSZ[1], L. MACHEJ[1], A. BOCHENEK[1]

[1]MEDICAL UNIVERSITY OF SILESIA, KATOWICE, POLAND; [2]DISTRICT HOSPITAL, KOSZALIN, POLAND

Endocarditits related to transvenously implanted cardiac resynchronisation therapy (CRT) system is a serious therapeutic challenge, particularly in patients in whom interruption of biventricular stimulation induces deterioration of their hemodynamic status.

We report on a patient with transvenous CRT system in whom infective endocarditits with blood cultures positive for S. epidermidids was diagnosed. Due to vegetations (>1 cm diameter) within the right atrium the patient was scheduled for surgical extraction of the CRT system.

A temporary interruption of biventricular stimulation during preoperative echocardiography induced a deterioration of global systolic function, appearance of asynchrony, increase in mitral regurgitation, and signs of dyspnoea and orthopnoe. Consequently, the patient was qualified for a combined procedure of infected CRT system removal with concomitant implantation of a new system with the use of epicardial leads.

The intervention was carried out with the use of median sternotomy, cardiopulmonary bypass and cardioplegic arrest. The right atrium was opened, the distal ends of all leads completely removed from the heart and cut off on the level of superior vena cava. Bipolar epicardial leads (CapSure Epi, Medtronic) were implanted on the right atrium, right ventricle and the lateral wall of the left ventricle and connected to the biventricular pacemaker (Insync III, Medtronic) located in the abdominal wall. After weaning from cardiopulmonary bypass, the chest was closed, and subsequently the old pacemaker completely with the proximal ends of the leads was removed. The postoperative course was uneventful. After 30 days the blood cultures were sterile, and the patients' clinical status improved. In the pre-discharge echocardiography an improvement in CRT effect was confirmed with LVEF=32% and a decrease in mitral and tricuspid regurgitation.

In conclusion, surgical extraction of transvenous CRT system with concomitant implantation of a new epicardial system proved to be an effective treatment method of infective endocarditis, without the necessity of CRT interruption.