08:30 - 10:30 S4 - Electrophysiology & Pacing Hall C

Chairs: **B. Belhassen**
M. Swissa

08:30 **Defibrillator Threshold Testing (DFT) During Implant in Atrial Fibrillation**
M. Geist, D. Tarchitzky, M. Kriwisky, L. Rosenshtein, T. Sela, M. Chesnakov, Y. Rozenman
Holon

08:45 **Microvolt T-wave Alternans and Electrophysiological Testing Predict Different Arrhythmia Outcomes: Lessons from the Alternans Before Cardioverter Defibrillator (ABCD) Trial**
G. Amit [1,2], D. Rosenbaum [2], O. Costantini [2]
[1] Beer-Sheva, [2] Cleveland, OH

09:00 **An "Aggressive" Protocol of Programmed Ventricular Stimulation is Useful to Select Post-Myocardial Infarction Patients with a Low Ejection Fraction who May Not Require Implantation of an Automatic Defibrillator**
B. Belhassen, T. Ohayon-Tsioni, A. Glick, S. Viskin
Tel-Aviv

09:15 **Electrophysiologic Studies Using an Aggressive Protocol of Programmed Ventricular Stimulation in Patients with Brugada Syndrome**
D. Fourey, G. Aharon, R. Rosso, Y. Michowitch, S. Viskin, B. Belhassen
Tel Aviv

09:30 **Bipolar RF Combined with Cryo-energy for Surgical Ablation of Atrial Fibrillation**
L. Sternik, D. Luria, M. Glikson, A. Malachi, M. First, E. Raanani
Tel-Hashomer

09:45 **Twelve Year Experience with Lead Extractions in a Referral Center**
M. Kazatsker [1], M. Berger [2], D. Luria [2], D. Simantov [2], H. Haj-Yihye [2], O. Agranat [2], H. Hod [2], A. Shotan [1], M. Eldar [2], M. Glikson [2]
[1] Hadera, [2] Ramat Gan

10:00 **Management and Outcome of Permanent Pacemaker and Implantable Cardioverter Defibrillator Infections**
M. Berger [1], M. Kazatsker [2], E. Asher [1], Y. Maor [1], O. Agranat [1], H. Hod [1], A. Glick [3], G. Rahav [1], D. Luria [1], M. Eldar [1], M. Glikson [1]
[1] Tel Hashomer, [2] Hadera, [3] Tel Aviv

10:15 **Clinical and Electrophysiologic Outcomes of Patients Undergoing Percutaneous Endocardial Ablation of Scar – Related Ventricular Tachycardia: Single Center Experience**
I. Marai, M. Suleiman, M. Blich, T. Zeidan-Shwiri, L. Gepstien, M. Boulos
Haifa

Defibrillator Threshold Testing (DFT) During Implant in Atrial Fibrillation

Michael Geist, Daniel Tarchitzky, Michael Kriwisky, Larisa Rosenshtein, Tal Sela, Marina Chesnakov, Yoseph Rozenman

Heart institute, Wolfson MC, Holon, Israel

Background: There is an ongoing debate regarding the need for DFT testing during Defibrillator (ICD) implant. It is also unclear what is the outcome of patients cardioverted during implant. One of the reasons not to attempt DFT during implant is the risk of cardio-embolic phenomena in a patient implanted with atrial fibrillation (AF).

Methods: The study group included 346 patients who underwent ICD implantation between 1993 and 2008 at our hospital. We included all patients that were in atrial fibrillation at time of ICD implant or VT study prior to implant.

Results: 18 patients were identified who where in chronic or persistent AF from 1 month to 20 years (80%) on chronic anticoagulation (Table 1). 3 underwent TEE due to inappropriate oral anticoagulation prior to procedure. 15 men (83 %), 4 (22%) had an artificial valve. All underwent DFT at implant with 14 (78%) reverting to sinus at time of DFT or during shock delivered during (EPS) prior to implant. 12 (67%) received an atrial based system. A significant number of the patients (11/14) remained in sinus for a median of 13 month. 10/12 (83%), with atrial based system. Although patients 10, 15, underwent repeat cardioversions (CV) in follow up. None had an embolic event even though we discontinue anticoagulation and normalize INR prior to surgery, and most did not undergo TEE prior to procedure.

Conclusions In our experience AF in patients with adequate chronic anticoagulation is not necessarily a contraindication to DFT testing. Counter to popular practice possibly there is even an advantage in doing DFT testing in patients with chronic AF since some patients convert and are more likely to remain in sinus with physiologic pacing.

	AGE	INDICATION	EF	DISEASE	AF	OAC	TEE	CV at EPS	CV	DEVICE	F/U MONTH
1	71	SCD HEFT	25	IHD	30M	Y	Y	N	Y	DC	3
2	61	MADIT	17	MVR	15y	Y	N	N	N	SC	AF
3	74	AVID	25	IHD	3Y	Y	N	Y	Y	DC	29
4	81	MUSTT	25	IHD	1M	Y	Y	Y	Y	DC	18M > AFL
5	77	VT	25	IHD	6M	Y	N	Y	Y	CRT	13
6	65	MUSTT	25	DCM	LT	Y	N	Y	Y	DC	11M > DIED
7	76	VT	35	AVR	20Y	Y	N	N	Y	SC	AF
8	67	MADIT	38	IHD	2Y	Y	N	Y	Y	SC	AF (1D)
9	62	VT	50	NCA	1Y	Y	N	N	Y	DC	AFL
10	77	VT	50	AVR +IHD	1M	Y	N	N	Y	DC	60
11	81	MADIT	29	IHD	1Y	Y	N	N	Y	CRT	4
12	68	MADIT II	20	IHD	23M	Y	N	N	Y	DC	7
13	74	AVID	40	IHD	1Y	Y	N	Y	Y	DC	48
14	77	VT	40	IHD	LT	Y	N	N	N	SC	AF
15	75	MADIT	20	IHD	LT	Y	N	Y	Y	DC	30M > AF
16	87	VT	40	AVR	LT	Y	N	N	Y	SC	10
17	74	MADIT	20	IHD	2Y	Y	N	N	N	CRT SC	AF
18	68	SCD Heft	20	IHD	1Y	N	Y	N	N	DC	AF

IHD –Ischemic heart disuse, CV Cardio version, TEE – Transesphageal echocardiography AVR – Aortic valve replacement, MVR – Mitral valve replacement, LT – > 2 years of AF SC – single chamber, DC – Double chamber, OAC – Oral anticoagulation, EF Ejection fraction, EPS – Electrophysiological study.

Microvolt T-wave Alternans and Electrophysiological Testing Predict Different Arrhythmia Outcomes: Lessons from the Alternans Before Cardioverter Defibrillator (ABCD) Trial

Guy Amit [1,2], David Rosenbaum [2], Otto Costantini [2]

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***Background*:** Although microvolt T-wave Alternans (MTWA) and electrophysiological study (EPS) are both markers for sudden cardiac death (SCD), the ABCD trial, found the combination to be more predictive than each alone. Therefore, we hypothesized that the two tests measure elements of the arrhythmogenic substrate, which lead to different arrhythmic outcomes.

***Methods*:** The ABCD Trial included 566 patients with ischemic cardiomyopathy, left ventricular ejection fraction (LVEF) ≤ 0.40, and documented non-sustained ventricular tachycardia. All patients underwent both MTWA test and EPS at enrollment. Implantable cardioverter defibrillators (ICD) were implanted in 87% of patients. The primary end-point was first appropriate ICD therapy or SCD. MTWA and EPS Core Laboratories blinded to outcomes adjudicated the tests, and an Events Committee blinded to the results of the tests adjudicated all events. Using Kaplan-Meier event rates and the log rank test, we analyzed the performance of MTWA and EPS in predicting distinct arrhythmic outcomes: 1. monomorphic ventricular tachycardia (MVT) vs. 2. the combination of polymorphic ventricular tachycardia (PVT) or ventricular fibrillation (VF) or SCD.

***Results*:** MTWA was normal in 29% and abnormal in 71%, and EPS was negative in 61% and positive in 39% of patients. There were 42 MVT events and 24 PVT/VF/SCD events, (8.8% and 5.6% 2-year event rate, respectively). At 1-year, MTWA predicted PVT/VF/SCD (event rate: 2.7% vs. 0% for MTWA abnormal vs. normal; $p=0.04$), but not MVT. In contrast, EPS predicted MVT (event rate 9.7% vs. 2.2% for EPS + vs. EPS -; $p<0.01$), but not PVT/VF/SCD. At 2 years MTWA was not a significant predictor of either arrhythmia outcome, but a positive EPS remained predictive of MVT (14.7% vs. 4.7%; $p<0.01$). Finally, LVEF (dichotomized by LVEF ≤ 0.30) was not predictive of either arrhythmia outcome.

***Conclusions*:** MTWA and EPS differ in the arrhythmic outcome they predict, and the time frame of prediction, suggesting that they identify different arrhythmogenic substrates. These data further suggest that multiple risk markers used in combination may better define and predict the complex electro-anatomical substrates which underlie the risk of SCD.

An "Aggressive" Protocol of Programmed Ventricular Stimulation is Useful to Select Post-Myocardial Infarction Patients with a Low Ejection Fraction who May Not Require Implantation of an Automatic Defibrillator

Bernard Belhassen, Tamar Ohayon-Tsioni, Aharon Glick, Sami Viskin

Cardiology, Cardiac Electrophysiology, Tel-Aviv, Israel

Objectives: To assess if non-inducibility with "aggressive" protocol of programmed ventricular stimulation (PVS) identifies post-infarction patients with low ejection fraction (EF≤30%) who may safely be treated without implantable defibrillator (ICD).

Background: The predictive value of electrophysiologic studies depends on the aggressiveness of the PVS protocol.

Methods: We studied 154 patients during a 9-year period. Our aggressive PVS protocol included: 1) stimulus current five-fold the diastolic threshold (≤3mA) and 2) repetition of double and triple extrastimulation at the shortest coupling intervals that capture the ventricle.

Results: Sustained ventricular tachyarrhythmias (VTA's) were induced in 116 (75.4%) of patients and 112 (97%) of them received an ICD (EPS+/ICD+ group). Of the 38 non-inducible patients, 34 (89.5%) did not receive an ICD (EPS-/ICD- group). In comparison to EPS+/ICD+ group, EPS-/ICD- group patients were older (69 ± 10 vs 65 ± 10 years, P<0.05), had a lower EF (23 ± 5% vs 25 ± 5%, P<0.05) and a higher prevalence of left bundle branch block (45.5% vs 20.2%, P<0.005). Follow-up was longer for EPS+/ICD+ group patients (40 ± 26 months) than for EPS-/ICD- group patients (27 ± 22 months) (P=0.011). Twelve (10.7%) EPS+/ICD+ group patients and 5 (14.7%) EPS-/ICD- group patients died during follow-up; p=0.525). Kaplan-Meier survival curves did not show a significant difference between the two groups (p=0.18).

Conclusions: The mortality rate in patients without inducible VTA's using an aggressive PVS protocol and who did not undergo subsequent ICD implantation is not different from that of patients with inducible arrhythmias who received an ICD. Using this protocol, as many as one-fourth of primary prevention ICD implants could be spared without compromising patient prognosis.

Electrophysiologic Studies Using an Aggressive Protocol of Programmed Ventricular Stimulation in Patients with Brugada Syndrome

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Introduction. The role of electrophysiologic studies (EPS) in the arrhythmic risk assessment of patients (pts) with Brugada syndrome is debated. The predictive value of EPS depends on the aggressiveness of the protocol of programmed ventricular stimulation (PVS) protocol.

Methods. During a 10-year period, we studied 68 patients (88% males), aged 20-85 (mean 43.8) years old. As in most EP laboratories, our PVS protocol included single, double and triple ventricular extrastimulation (ES) delivered from 2 right ventricular sites (apex and outflow tract) at 2 basic cycle lengths (600 and 400msec). However, it differed by 1) the use of stimulus current at 5-fold diastolic threshold (DT) (but always $\leq$ 3mA) and 2) repetition of ES at the shortest coupling intervals (10 times for double and 5 times for triple ES, respectively).

Results: All pts had a type 1 Brugada-ECG observed spontaneously (n=19) or following IV administration of flecainide (n=49). 6 pts had a history of aborted cardiac arrest, 25 pts had syncope, and 37 pts were asymptomatic. Sustained polymorphic VT/VF was induced in 47 (69%) pts. Inducibility rates were 100%, 75% and 62% in pts who presented with aborted cardiac arrest, syncope, or were asymptomatic, respectively ($p<Z$).

EPS-guided quinidine therapy was performed in 43/47 pts with inducible VF. In 38 (88%) of 43 pts, quinidine therapy was effective in preventing VF re-induction. Quinidine therapy could be continued during long-term in 26 EPS drug-responders. An ICD was implanted in 16 pts. During a follow-up of 3 to 128 (mean 52) months, all pts but 1 who died from cancer are alive. None of the pts had appropriate ICD discharges. No arrhythmic event occurred in any other pts.

Conclusions. VF inducibility is very high in pts with Brugada syndrome during EPS using an aggressive PVS protocol. Although the sensitivity of this protocol is excellent, it may lead to false positive results leading to unjustified treatment in pts without prior cardiac arrest. Quinidine is very effective in preventing VF re-induction at EPS. No arrhythmic event occurred on this therapy,

Bipolar RF Combined with Cryo-energy for Surgical Ablation of Atrial Fibrillation

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Background: In the past decade numerous ablation devices have been introduced into the surgical practice. We describe results of a combination of bipolar radiofrequency (RF) and cryo for surgical ablation of atrial fibrillation (AF). And a new trend for the surgical treatment of isolated AF.

Methods: From February 2004 till October 2008 we used this method on 182 patients. Seventy-six patients suffered from permanent AF (45%), fifty-five had persistent atrial fibrillation (32%), and forty patients had paroxysmal AF (23%). We used lesions set similar to Maze III procedure in the left atrium with addition of right atrial lesion set in some patients. Forty-two patients had left atrial volume more than 200 cc (23%). 17 patients (9%) had permanent AF for more than 10 years.

Results: Most patients underwent AF ablations as an additional procedure to mitral valve surgery (74%). There were two postoperative deaths, five patients had stroke after surgery (3%).

Average time for ablation was 30 minutes (range 27-36) for biatrial and 16 minutes (range 15-19) for left atrial procedures. One hundred twenty-nine patients (75%) were discharged in sinus rhythm. Mean follow-up was 26 months (1-52 months). At the end of follow-up 79% of patients were in sinus rhythm. Predictor for recurrent AF or atrial flutter after procedure was preoperative permanent AF for more than 10 years ($p = 0.025$). Size of the left atrium was not found to be a factor for failure. Five patients underwent minimally invasive surgical ablation for stand alone.

Conclusion: The use of bipolar RF device with cryoprobe is an appealing combination. It enables to complete a Maze III lesion set in an easy, safe and efficient way.

Twelve Year Experience with Lead Extractions in a Referral Center

Mark Kazatsker [1], Michael Berger [2], David Luria [2], Daniel Simantov [2], Hany Haj-Yihye [2], Oren Agranat [2], Hanoch Hod [2], Avi Shotan [1], Michael Eldar [2], Michael Glikson [2]

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Over the last 12 years we have been a referral center for lead extraction.
We sought to review our experience, and to compare the results of our intitial experience with later experience .
Methods: Retrospective analysis of a prospectively collected database of all 152 cases of lead extractions performed by 2 operators since 1996.
Results: Since 1996 we extracted 258 leads in 152 patients, 101 of whom (66%) were referred from 20 other hospitals. Indications were: pocket infection or erosion in 50(32.9%) systemic infection in 57(37.5%) redundant nonfunctioning leads 26(17.1%) venous occlusion 5(3.3%) and others 14(9.2%) . Leads extracted included 81 atrial 95 ventricular pacing 65 ICD 13 LV and 4 others . Mean implant duration was 5.05y. Tools used included locking stylets 179(69%), dilator sheaths 147(60%), electrodissection sheaths 45(17.4%) and femoral tools in 35(13.6%) .
For analysis of results cases were divided into initial group of 50 earliest cases and later group of the following 100 cases. In the early group extraction resulted in complete success, partial success and failure in 59(81.9%), 3(4.1%) and 8(11.1%) respectively . In the later group corresponding numbers were 179(96.2%), 3(1.6%) and 2(1.1%) respectively. The difference in favor of the later group was significant ($P<0.05$) .
Complications occurred in 2(3.8%) and in 2(2%) in the early and late group respectively. There was one procedure related death in the early group .
Conclusions: Extractions are complex procedures that necessitate a wide range of tools and significant experience for success. Performance improves significantly after the first 50 cases

Management and Outcome of Permanent Pacemaker and Implantable Cardioverter Defibrillator Infections

Michael Berger [1], Mark Kazatsker [2], Elad Asher [1], Yasmin Maor [3], Oren Agranat [1], Hanoch Hod [1], Aharon Glick [4], Galia Rahav [3], David Luria [1], Michael Eldar [1], Michael Glikson [1]

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Objectives –Our center is a referral center with expertise in extractions and a uniform protocol for infection management. We reviewed our recent experience with device infections.

Methods – Retrospective review of a prospectively collected database of extractions since 2004

Results –Complete data were available for 76/82 pts. 62/76 were referrals from 20 hospitals. Extracted systems included 31 PPM, 31 ICD, 11 CRTP/CRTD and 3 abandoned leads. Manifestations included pocket infection in 49 (74%), 7 (14%) of which with bacteremia, and endocarditis in 27 (36%). Pathogens were Staphylococcus aureus (21%) Coagulase- (16%), Gram - (13%), other gram (+), MOTT and Candida (7%), cultures negative in 43%

72 **(**95%**)** underwent complete system removal **(**57/58 atrial 72/75 ventricular and 11/11 LV leads). 17 (22%) needed postoperative temporary pacing. A new device was implanted in 36 pts (48%). In 33 (43%) of cases no new implantation was performed until discharge (16) or transfer back to the referring hospital (17). There were no procedure-related mortalities. 30d mortality was 5% (4 pts) (2 - intractable sepsis, 1-CVA 1-CHF). 3 pts (4%) died later during follow up from intractable CHF. There were no cases of recurrent infection on newly implanted systems.

Conclusions: Device infection is a severe potentially lethal disease involving a very sick patient population. Despite successful complication-free system removal and systematic approach to infection management some patients succumb later due to intractable infection and comorbidities. It is conceivable that earlier referral could have resulted in better outcome. In many pts device re-implantation can be deferred to enable complete resolution of the infection.

Clinical and Electrophysiologic Outcomes of Patients Undergoing Percutaneous Endocardial Ablation of Scar – Related Ventricular Tachycardia: Single Center Experience

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***Background*:** For patients who have a ventricular tachyarrhythmic event, implantable cardioverter–defibrillators (ICDs) are a mainstay of therapy to prevent sudden death. However, ICD shocks are painful, can result in clinical depression, and do not offer complete protection against death from arrhythmia. Radiofrequency catheter ablation of ventricular tachycardia (VT) in the setting of ischemic cardiomyopathy has emerged recently as useful adjunctive therapy to ICD. The purpose of this study was to assess the feasibility, safety, and efficacy of our initial experience in ablation of scar-related VT.

Methods and Results: Between May 2006 and November 2008, eleven patients (all males, mean age 72±5 years) with drug-refractory ischemic VT were referred to our center for scar mapping and ablation procedures using the CARTO navigation system. A total of 18 (mean cycle length, 398+/-71 ms; 13 % poorly tolerated) VTs were induced in all patients. An endocardial circuit, identified by activation, entrainment, and/or pace mapping, was found in 8 patients. These patients were mapped and ablated during VT. Three patients had predominantly unstable VT and linear ablation lesions were done during sinus rhythm. Acute success, defined as termination of VT and or non-induceability during electrophysiologic study was in 9 (82%) patients, one of them had recurrence of VT two days after the procedure. One patient, who was admitted due to end stage heart failure, died several days after failed ablation procedure. During follow-up, a significant reduction in tachyarrythmias burden was observed in all patients who had successful initial ablation.

***Conclusion*:** Ablation of ischemic VT using electroanatomic scar mapping is feasible with acceptable success rate and should be offered for ischemic patients with recurrent uncontrolled VT.