

Atrial Fibrillation Ablation: Surgical MAZE Procedure vs. Catheter Based Pulmonary Vein Isolation

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MAZE procedure is highly effective when performed during mitral valve surgery, partially, due to correction of left atrium pressure/volume overload. Results of MAZE during "non-mitral" surgery depend mostly on effective modification of arrhythmogenic substrate, similarly to catheter based pulmonary vein isolation (PVI).

We sought to compare results of atrial fibrillation (AF) ablation in patients underwent PVI vs. patients who had "non-mitral" MAZE procedures.

Methods and Results: Study cohort comprise PVI (group 1, n= 140) and MAZE (group 2, n=78). Ablation in group 1 was performed by double transseptal technique, using Lasso mapping catheter and open irrigation RF ablation catheter. Two pairs of pulmonary veins were isolated using 3D mapping. Group 2 consists of patients who underwent aortic valve surgery (n=38, 49%), coronary bypass (n=28, 36%), "stand alone" MAZE (n=9, 12%) and other procedures (tricuspid valve, aortic surgery, myectomy; n= 15, 20%). Most patients underwent only left atrial MAZE (n=60, 77%). Twelve pts (15%) underwent bi-atrial MAZE and 6 (8%) - PVI only. Patients were followed at the clinic at 3, 12 months and then annually. ECG was performed daily by event recorder during the first 6 months after the procedure. Holter 24-48 hours was performed on every clinic visit. Patients characteristics and follow up results summarized in Table. Patients in group 1 had intraoperative complications in 14 cases (10%), including tamponade (n=8), TIA/CVA (n=3), lasso entrapment (n=2) and major bleeding (n=1). During the follow up, 4 patients had evidence of pulmonary vein stenosis. Patients in group 2 had only 2 cases of complications (CVA and diaphragmatic paralysis) directly related to MAZE procedure. Conclusions: MAZE procedure in "non-mitral" surgery has similar efficacy, as catheter based PVI, despite more cases with persistent AF and bigger left atrium size in surgical group. Surgical patients had fewer complications, directly related to ablation procedure.

	PVI (group1)	MAZE (group 2)	p value
Total number	140	78	
Age (years)	56±11	67±11	<0.0001
Males	102 (73%)	58 (74%)	0.8
Paroxysmal AF	119 (89%)	22 (30%)	<0.0001
Persistent AF	13 (10%)	38 (52%)	<0.0001
Permanent AF	1 (1%)	13 (18%)	<0.0001
Left atrial volume	81±33	110±38	<0.0001
Follow up duration (mo)	16±16	23±18	0.007
Follow up > 3mo	129	68	
RE DO procedure	11 (8%)	0	<0.0001
Failure (AF)	15 (12%)	8 (12%)	0.7
Failure (Flutter)	2 (2%)	4 (6%)	0.06
Success with drugs	11 (87%)	56 (82%)	0.4
Success without drugs	59 (46%)	47 (69%)	0.05

Left Atrial Ablation for Atrial Fibrillation: Box Lesion Versus Epicardial Pulmonary Vein Isolation

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Background: Maze with a "Box lesion" around pulmonary veins (PV) is the gold standard procedure. Recently, we changed our technique of surgical ablation of atrial fibrillation (AF) from standard bilateral epicardial PV isolation to "Box lesion" with bipolar radiofrequency (RF) ablator. In this study we compare these techniques.

Methods: Between March 2009 and October 2011 we performed AF ablation in 70 patients by the "Box" technique around the PV, using a bipolar RF device. Patients were 64±10 years. 40 (56%) patients had persistent and 15 (22%) permanent AF; "Box" was made by connecting left atriotomy to the base of amputated left atrial appendage with two lines along transverse and oblique sinuses by epi- and endocardial application of a bipolar RF device. Left atrial isthmus was ablated by cryoprobe. Non-box group of 80 patients was operated by epicardial PV isolation with interconnecting lesions and left atrial isthmus lesion with the same devices.

Results: No complications were related to the ablation. Both groups were matched retrospectively to be statistically similar from all preoperative parameters. 63 (79%) patients in non-box group and 64 (92%) patients in box group were in sinus rhythm at discharge (p=0.05). 58 (74%) patients in non-box group and 65 (93%) of patients in box group were in sinus rhythm at 1 year follow-up (p=0.044).

Conclusions: "Box lesion" is easier to perform and provides better freedom from AF than bilateral epicardial PV isolation with interconnecting lesions. We can explain it by better transmuralitity achieved by applying bipolar RF ablator only on one layer of atrial wall in contrary to epicardial PV isolation.

Mitral Regurgitation Improvement after Conversion of Atrial Fibrillation to Sinus Rhythm
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Background: Presently there is limited data on the effect of atrial fibrillation (AF) on the severity of mitral regurgitation (MR). **Objective:** To determine whether in pts with significant MR, conversion of AF to sinus rhythm might reduce the severity of MR.

Methods: Between 1992-2011, 446 pts (52% females, mean age 74.0 ± 12.3 yrs) with significant MR and AF underwent cardioversion to sinus rhythm. All had follow up echocardiography within 6 months. We compared the severity of MR during AF to that during sinus rhythm. Improvement was regarded if MR was reduced by at least 2 grades.

Results: After 6 months, 278 (62.3%) pts remained in sinus rhythm (group 1) and 168 (37.7%) were in AF (group 2). There was no difference between the groups with regard to hypertension, diabetes, stable or unstable coronary artery disease. In 122 (27.4%) pts, MR severity improved by more than two grades and it was more pronounced in males 32.5% vs females 22.6% ($p=0.019$). Significant MR improvement was seen group 1 compared to group 2 (32.4% vs 19%, $p=0.002$). Left ventricular diameter improved significantly (left ventricular end diastolic (LVEDD) from 5.13 cm to 4.98cm, $p=0.036$, left ventricular end systolic (LVESD) from 3.62cm to 3.40cm, $p=0.0314$) compared to group 2 (LVEDD 5.18cm to 5.25cm, $p=0.3410$, LVESD 3.69cm to 3.71cm, $p=0.2995$). In univariate analysis, sinus rhythm (OR 1.73, $p=0.024$), male gender (OR 1.55, $p=0.046$) and time interval between echo test less than 42 days (OR 1.52, $p=0.059$) were predictors for significant MR improvement. In multivariate analysis, sinus rhythm remained independent factor for significant MR improvement (OR 1.9, $p=0.007$).

Conclusions: In 27% of pts with paroxysmal AF, MR improves significantly after cardioversion to sinus rhythm. Final assessment of MR severity should be based on echocardiographic data when the patient is in sinus rhythm.

Epicardial Ablation of Ventricular Arrhythmia

Single Center Experience

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A novel approach to ablation of ventricular arrhythmia originating from epicardium, by direct trans-thoracic catheterization of epicardial space was recently reported. We sought to present our initial experience with this approach.

Methods and Results: Thirteen patients underwent 16 epicardial procedures. Indications were left ventricle outflow (LVOT) PVC's with PVC's-induced cardiomyopathy (7 pts) and VT due to ischemic (1pt) or non-ischemic (5 pts) cardiomyopathy. In all but 1 patient epicardial ablation was performed after previous failed attempts of endocardial or endovascular (coronary sinus (CS), aortic cusp) approach. CARTO mapping was performed in all 6 VT cases. In 4 of them, with use of simultaneous endocardial and epicardial mapping. In patient with PVC's, 4F Cardima catheter was used to facilitate mapping in all but one case. Procedure was performed under general anesthesia in 4 patients and under conscious sedation in others. Open irrigation ablation catheter was used in all but three cases. Coronary angiography was performed in all cases before epicardial ablation in LVOT. Consequent to the coronary angio, ablation was avoided due to proximity to major coronary arteries in 3 cases. Epicardial ablation was performed in 13 cases: 11 with radiofrequency (RF) and 2 with CRYO energy. Arrhythmia terminated in 7 cases ("acute success"). In 2 cases (PVC's) late recurrence necessitates additional procedure and in another 2 (VT) - few recurrences were successfully managed by medical and ICD therapies. No complication was related to epicardial access. In one case, acute LAD occlusion occurred after RF energy application that was treated with PCI.

Conclusions: Epicardial approach is useful for ventricular arrhythmia mapping and ablation. Success rate is modest, especially in LVOT PVC cases, where proximity to coronary arteries can prevent optimal energy delivery and cause acute vessel's occlusion. Epicardial access is safe and can be performed using conscious sedation.

Outcome of ACS Patients Complicated by VT or VF from the ACSIS Cohort

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Background: Most of the data regarding the occurrence of VT/VF among patients hospitalized with acute myocardial infarction (AMI) and associated prognosis were obtained before the reperfusion era, whereas data on VT/VF in the era of primary percutaneous coronary intervention (PCI) are limited and conflicting regarding early and late prognosis.

Aim: To evaluate the incidence and outcome of patients with AMI presenting with early and late VT/VF.

Methods and results: We studied 7669 patients from the Acute Coronary Syndrome Israeli Survey (ACSIS) between the years 2002-2010 which included ST elevation (n=3573) and non ST elevation MI-ACS (n=4096). We divided them into 3 groups: patients with no VT/VF, early (<48h) VT/VF and late (>48h) VT/VF. Of the 7669 patients with ACS, 7369 (96%) had no VT/VF, 166 (2.1%) had early VT/VF and 134(1.7%) had late VT/VF. Baseline characteristics were significantly different among the 3 groups; with higher number of coronary risk factors and co-morbid conditions in the VT/VF groups and notably younger age (mean 60±12) in the early VT/VF group. Patients with late VT/VF had a more complex hospital course with higher frequency of mechanical and arrhythmic complications other than VT/VF, and longer hospital stay. Mortality data are given in the table:

	No VT/VF	Early VT/VF	Late VT/VF	P value
In hospital Mortality	271 (3.7%)	25 (15.1%)	38 (28.4%)	<0.001
30-Day Mortality	311 (4.2%)	25 (15.2%)	40 (29.9%)	<0.001
1-Year Mortality	531 (9.5%)	24 (20.3%)	41 (40.2%)	<0.001
MACE 30 Days	618 (8.3%)	31 (18.7%)	45 (33.6%)	<0.001

After adjustment for multiple confounders early VT/VF was shown to be associated with increased risk of in-hospital death (OR=2.8; CL 95% 1.3-5.9), but not with increased post discharge 30-day (HR=0.94; CI 95% 0.12-7.1) or 1-year mortality risk (HR=1.3; CI 95% 0.5-3.2). In contrast, late VT/VF was associated with increased 30-day mortality risk (HR=5.7; CI 95% 1.7-19.15) and a trend for increased 1-year mortality risk (HR=1.9 CI 95% 0.85-4.35)

Conclusions: In this study early VT/VF was associated with increased risk of in-hospital death but not with increased post discharge, whereas late VT/VF was associated with increased risk of 30-day death and a trend for increased 1-year mortality risk.

Analysis of Depolarization Abnormalities in the Evaluation of Patients with Chest Pain

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Background: The ECG of patients presenting with chest pain and suspected myocardial ischemia or infarction (MI) is often normal or non-diagnostic. Ischemia causes depolarization changes that can be quantified by computerized analysis of high-frequency mid-QRS components (HFQRS). We aimed to evaluate the usefulness of HFQRS analysis in detection of acute ischemia in patients with chest pain.

Methods: High-resolution, 12 lead ECG was acquired in the emergency department in 172 patients (age 61 ± 13 yrs, 119 men) with acute chest pain, and was used to assess both HFQRS and ST-T abnormalities. Patients were classified post-hoc based on discharge diagnosis and one-month follow-up as ST-elevation MI (STEMI, N=10), non STEMI (NSTEMI, N=19), unstable angina (UA, N=18) and non-ischemic chest pain (NICP, N=80). Patients with uncertain diagnosis (N=16) or inadequate signal quality (N=29) were excluded. High-frequency morphological index (HFMI), which quantifies the extent of HFQRS signal abnormalities (in %), was computed using custom software.

Results: The time from onset of chest pain to ECG acquisition was 5.1 ± 4 hrs. ST-T abnormalities were indicative of ischemia in 92% of STEMI pts, 45% of NSTEMI pts and 14% of UA pts; ST-T morphology was normal in 75% of the NICP pts. The HFMI was significantly higher in ACS pts compared to NICP pts (7.2 ± 3 vs. 4.8 ± 3 , $p < 0.001$), with no difference between the 3 ACS groups. In the subgroup of pts with normal or inconclusive ECG, NSTEMI and UA pts had higher HFMI than NICP patients (7.7 ± 3 vs. 4.7 ± 3 , $p < 0.001$). HFMI was negative in 12 of 14 NICP patients with inconclusive ECG and positive in all 8 ACS patients with inconclusive ECG. HFMI diagnosis was significantly more sensitive than conventional ECG interpretation (70% vs 51%, $p < 0.001$) with comparable specificity.

Conclusions: HFQRS analysis provides indications of acute ischemia, complementary to conventional ECG. HFQRS-derived indexes may aid in rapid risk stratification of patients with chest pain.

