ORAL ABSTRACT SESSION: IT’S NOT ALL ABOUT ABLATION:
ELECTROPHYSIOLOGICAL INSIGHTS FROM LEFT ATRIAL INTERVENTION

ELECTROPHYSIOLOGICAL FINDINGS FOLLOWING SURGICAL THORACOSCOPIC UNILATERAL ATRIAL FIBRILLATION ABLATION
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Purpose: Hybrid ablation (i.e. a combination of surgical thoracoscopic pulmonary vein (PV) isolation created using a box lesion on the posterior wall of left atrium followed by catheter ablation) has become a new technique for patients with persistent or long-lasting persistent atrial fibrillation (PeAF) or atrial flutter. However, EP findings following thoracoscopic ablation have not been described yet.

Methods: Patients with PeAF were studied. Surgical ablation was carried out using unilateral thoracoscopic approach and a CO2RRA radiofrequency multipolar catheter. The aim of surgical approach was to create a box lesion surrounding all four PVs. An EP study was done 1.3 months later to verify and complete box lesion on the posterior wall, and to perform right sided isthmus ablation. All patients were monitored for using 1-week Holter 1, 3 and 6 months after surgical ablation.

Results: Eighteen patients with PeAF aged 58.9±10.4 years, 13 males, AF duration before ablation 27.8±23.8 months were enrolled in the study. Surgical ablation was provided as described. An EP study was done 1.3 months later (mean duration was 222.8±59.3 min and fluoroscopic time was 21.4±7.0 min). The CARTO atrial volume measurement was 133.7±55.9. Box lesion completeness, based on the EP study, was in 7 (39%) patients. In the remaining 1161% patients, the box lesion was incomplete. Completeness (using an RF ablation) was achieved in 9 of 11 patients (82%). Gaps were found in the superior line between the left and right superior pulmonary veins in 4 patients and anterior to the right or left superior pulmonary veins in the remaining 5 patients. In two patients, gaps were not localized due to multiples gaps or ongoing AF. The inferior line and the anterior parts of left and right inferior veins were completed in all patients. At the 6-month follow-up, AF free survival, without anti-arrhythmic drugs, was present in 15 83% patients. Two patients developed atrial fibrillation with successful cardioversion and one patient sustained in AF. Conclusion: The hybrid approach in patients with PeAF was successful in most patients. The superior line and anterior parts of the right and left superior PVs were most likely to have conduction gaps following surgical ablation.

REFERENCE VALUES FOR CONDUCTION TIMES TO IDENTIFY ACHIEVEMENT OF BIDIRECTIONAL BLOCK AFTER LEFT ATRIAL LINEAR ABLATION (ROOF, INFERO laterAL OR SUPEROSEPTAL MITRAL ISTMUS)
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Introduction: In patients (pts) undergoing left atrial (LA) linear ablation in addition to pulmonary vein isolation (PVI), bidirecional block is required for success and to avoid post-procedural atrial arrhythmias. Preliminary data from our center showed that LA conduction times that could reliably identify achievement of bidirectional block.

Methods: Consecutive pts undergoing PVI and LA linear ablation [at the roof and at the infro lateral or supero septal mitral isthmus (MI), i.e. between the mitral annulus and the left inferior or the right superior PV] between August 2010 and October 2014 were enrolled. Success was defined by widely split double potentials, differential pacing and changes in activation sequence (using conventional or 3D mapping, NAVX, SIM) during pacing on each side of and close to the line. Operating characteristic (ROC) curves are used to identify the trans-isthmus conduction time reliably identifying bidirectional block.

Results: 183 pts (63 57, 69 years old, 68 (37%) female, 130% persistent AF, first diagnosis since 40 (18, 76) months) underwent successful PVI. Bidirectional block was achieved in 178 (97%), 96 (92%), and 83 (87%) pts at the roof, infro lateral and supero septal MI, respectively. At ROC analysis, trans-isthmus conduction times values best identifying bidirectional block were: 1) roof line: ≥127 msec pacing from the LA appendage (LAA) (AUC 0.98, SE 96%, SP 100%) and ≥166 msec pacing from the posterior wall to the LAA (AUC 0.83, SE 98%, SP 66%); 2) infro lateral MI: ≥171 msec pacing from the LAA (AUC 0.99, SE 99%, SP 100%) and ≥100msce pacing from the infro lateral wall (AUC 0.99, SE 98%, SP 96%); supero septal MI ≥157 msec pacing from the LAA (AUC 0.96, SE 93%, SP 92%) and ≥142msce pacing from the septum (AUC 0.98, SE 96%, SP 92%).

Conclusion: ROC analysis of trans-isthmus conduction times in a large series of consecutive pts undergoing LA linear ablation with high rates of bidirectional block provides values to identify bidirectional block with excellent sensibility and specificity.

Congenital atrial septal defect and atrial fibrillation: staged approach in complex endovascular treatment
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Purpose: Atrial septal defect (ASD) is a common congenital heart defect. The adverse prognosis of untreated ASD diagnosed in childhood is well studied and perioperative device closure of these ASDs has evolved to become the standard of care adult populations. One of the main causes of deterioration of clinical course of the disease in adult patients with ASD is occurrence of symptomatic atrial tachyarrhythmia (atrial fibrillation/flutter). Recent data have shown that the surgical closure of ASD does not prevent the occurrence of arrhythmies. The aim of this study was evaluation of the role left atrial catheter ablation in atrial fibrillation (AF) treatment before ASD device closure.

Methods: From June 2011 to May 2014, 14 ASD patients with drug-refractory paroxysmal AF eligible for ASD percutaneous device closure underwent staged interventions: 1) Radiofrequency catheter ablation (RCA) - anatomical and electrical pulmonary vein isolation (PVI) and ablation of cavotricuspid isthmus (CTI). 2) ASD percutaneous device closure. ASD closure was performed 3 months later after ablation. Electrophysiological (EPI) study was performed before decision closure for evaluation the competency of ablation lines. Mean age was 51 9 years, and 38% were males. The median preoperative AF duration was 28 months.

Results: After a mean follow-up of 6 months after ASD closure, 69% of all patients were free from atrial arrhythmias without the use of antiarrhythmic drugs (AAD) and 10% with AAD. We observed no major peri-procedural adverse events, no strokes or mortalities. During EPI study immediate before ASD closure in 40% patients was observed reconnection in isolation lines around pulmonary veins and additional point ablation for gap closure was done.

Conclusions: Our observational study shows that PVI for the treatment of paroxysmal AF is safe and effective in adult patients with atrial septal and may be used with acceptable results in complex endovascular treatment mentioned congenital heart disease.
Non-pulmonary vein foci (NPVF) are related to atrial fibrillation (AF) after pulmonary vein isolation (PVI). Impact of NPVF after multiple PVI on AF recurrence has not been clarified.

**Purpose:** To determine the presence of NPVF and impact on AF recurrence after multiple PVI. CP and CT injections were performed during AF and sinus rhythm 12 months after PVI.

**Methods and results:** NPVF were detected at the 2nd procedure in 20 patients (47%) vs 3 patients (13%), P = 0.014, and showed breakthrough sites of LA were significantly larger in PAF group than those in control group (4.2 ± 1.2 vs 2.0 ± 1.0, P = 0.001).

**Conclusion:** Specific arrhythmogenic substrate revealed by burst pacing maneuver for PAF mainly existed in LA but not in RA. These results may be relevant to important clues of new application sites and methods for AF ablation.

**References:**


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**Background:** Non-pulmonary vein foci (NPVF) are related to atrial fibrillation (AF) recurrence after pulmonary vein isolation (PVI). Impact of NPVF after multiple PVI on AF recurrence has not been clarified.

**Method:** This study consists of 243 patients (paroxysmal AF, n=165) who had undergone the 1st PVI. All the subjects underwent electrophysiological study 6 months after the 1st PVI and the cases with AF recurrence received additional AF ablation including NPVF. The presence of NPVF was determined in control and during drug infusion (isoproterenol and adenosine triphosphate) at 1st and 2nd procedure. We examined effects of NPVF on AF recurrence after 2nd procedure, as well as predictive factor for the development of NPVF.

**Results:** NPVF were detected in 20 patients and 49 patients at the 1st and 2nd session, respectively. While 21 patients without NPVF at the 2nd session had AF recurrence in 3 cases and had significantly higher AF recurrence rate than those without NPVF (P = 0.025) (P = 0.025). NPVF detected at the 2nd procedure, and left atrial volume were indepent predictive factor for AF recurrence after 2nd procedure.

**Summary:** Development of NPVF was found at the 2nd procedure after the initial PVI, which was an increased risk for AF recurrence. Detection of non PV foci and their ablation may be an important therapeutic option to decrease in incidence of AF recurrence, especially at repeated procedures.
CLINICAL SIGNIFICANCE OF EVALUATING BIDIRECTIONAL DORMANT CONDUCTION AFTER PULMONARY VEIN ISOLATION

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Background: Transient reconduction from the left atrium (LA) to the pulmonary vein (PV) by intravenous adenosine triphosphate (ATP) administration (entrance dormant conduction) has been commonly evaluated after pulmonary vein isolation (PVI) for atrial fibrillation (AF). However, the opposite directional conduction unmasked by ATP (exit dormant conduction) has not been investigated.

Methods and Results: Fifteen patients (age 67.5 ± 22 years, 11 men) consented to be enrolled in the study. The patients underwent a follow-up electrophysiology study (EPS) 6 months after PVI. PVs showing reconduction at baseline were excluded. A total of 42 PVs were evaluated. Exit dormant conduction was assessed by administration of ATP during low-output pacing (5 mA, 2 ms) from PV using a ring catheter. Entrance dormant conduction was observed in two of the 42 PVs (4.8 %), and exit dormant conduction was documented in one of those (2.4 %). For the other 40 PVs, neither entrance dormant conduction nor exit dormant conduction was observed. No PV showed unidirectional exit dormant conduction.

Conclusion: Unidirectional exit dormant conduction was not seen in any of the PVs. This observation supports the theory that exit dormant conduction is not necessary to evaluate after PVI.

CATHETER BASED EPICARDIAL SUBSTRATE ANALYSIS IN PATIENTS WITH REFRACTORY ATRIAL FIBRILLATION

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Pulmonary vein (PV) isolation is a recommended therapy in patients with drug resistant atrial fibrillation (AF). Accumulating evidence suggests that in patients with diseased left atria (LA) tailored modification of the LA substrate is necessary to prevent recurrences. It has been demonstrated that reduced electrogram amplitudes as recorded by endocardial voltage maps correlate with LA fibrosis and scarring. During ablation of patients with structural heart disease and recurrent ventricular tachycardia electrophysiologists specifically treat low voltage areas. But in some of these patients endocardial voltage does not always predict epicardial voltage. Whether the same holds true for the LA substrate has not been investigated so far.

A total of 22 (mean age 63 ± 9 years, 50% male, mean CHA2DS2 VAsc score 2 ± 1, body mass index 28 ± 3) consecutive patients with symptomatic atrial fibrillation were included in our study. All patients had undergone at least three unsuccessful previous catheter ablation attempts. All patients were ablated with support of the CARTO UNIVU mapping system. After informed consent a standard percutaneous pericardial access was created (Agilis epi, St. Jude Medical). Subsequently the endocardial LA was approached by transseptal puncture (Agilis, St. Jude Medical). During stable sinus rhythm a detailed biatrial endocardial and epicardial voltage mapping was performed (peak-to-peak bipolar electrogram amplitude >0.5mV = healthy atrial myocardium). The LA and the RA were divided into multiple sections in order to describe the distribution of low voltage areas and to quantify the extent of the substrate endo- as well as epicardially.

18/22 (82%) redo patients presented with complete PV isolation and low voltage areas outside the PVs. In all patients with low voltage areas the substrate was confined to the LA only. Endocardial low voltage areas tended to be larger. In none of the studied patients epicar- dial low voltage areas were found in the absence of endocardially diseased myocardium. Epicardial catheter ablation was exclusively performed to complete bidirectional conduction block of linear ablation lines.

Our data show, (i) catheter based epicardial voltage mapping in AF patients is feasible, (ii) the epicardial atrial muscle layer does not seem to contain AF arrhythmia substrates which are undetected by endocardial voltage mapping, and (iii) epicardial mapping/ablation of refractory AF serves predominantly the purpose to complete bidirectional conduction block over linear ablation lines positioned for individually tailored substrate modification.