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Non-Fluoroscopic Magnetic Electroanatomic Mapping of Pulmonary Veins During Spontaneous or Induced Premature Depolarization to Guide Radiofrequency Ablation of Focal Atrial Fibrillation

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Background: Radiofrequency (RF) ablation of ectopic foci in the pulmonary veins (PV) can effectively eliminate atrial fibrillation (AF). Endocardial activation mapping may be limited by infrequent occurrence of atrial premature depolarization (APD), such that it is difficult to localize and then navigate the ablation catheter back to the earliest activation site for RF ablation.

Methods: We studied 11 pts (mean age 44 ± 11 yrs, 8 males) with drug refractory paroxysmal AF who underwent RF ablation of focal AF. After transeptal puncture, PVs location were documented by angiography and tagged by nonfluoroscopic magnetic electroanatomic mapping (CARTO, Bisense) to define anatomic location. Then CARTO activation mapping was performed during spontaneous or induced (by rapid atrial pacing, isoprenaline infusion \pm internal defibrillation) ADPs and/or runs of nonsustained AF. Both the electrogram and location of endocardial activation that occurred within ± 50 ms of the cycle-length of APD with respect to coronary sinus electrogram were automatically captured. RF applications were delivered at the site with earliest activation as guided by the CARTO map.

Results: 9 (82%) pts had ADPs or runs of AF that allow successful CARTO mapping of PV foci (median number of mapping site: 13, range 8-46). 11 arrhythmogenic sites were identified (left superior PV=5, right superior PV=3, right middle PV=1, right inferior PV=1, left inferior PV=1). CARTO guided focal RF ablation targeting sites of earliest site of activation (median RF applications: 4 per site) acutely eliminated all spontaneous or induced APD in 8/9 pts. No significant PV stenosis was observed after RF. After a mean follow-up of 5 ± 4 months, 6/9 (67%) of patients had no arrhythmia recurrence without drug.

Conclusion: Non-fluoroscopic magnetic electroanatomic catheter mapping of PV during spontaneous or induced APDs, can facilitate the mapping and RF ablation of focal AF. This technique is applicable in pts with a limited number of APDs and AF initiation during the procedure using a minimum number of RF applications.

S-C-8

First Experience of Non-fluoroscopic Magnetic Electroanatomic Mapping Guided Alcohol Ablation of the Atrioventricular Node

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Background: Radiofrequency (RF) ablation of arrhythmia has limited efficacy in patients with arrhythmia that have a site of origin far from the endocardial contact point of an intracavitary catheter, such as reentrant ventricular tachycardia. The aim of this study was to evaluate a novel technique of direct myocardial injection under guidance by 3D non-fluoroscopic magnetic electroanatomic mapping (NOGA, Biosense) for alcohol ablation of the atrioventricular node. **Methods and Results:** We performed non-fluoroscopic magnetic electroanatomic mapping guided alcohol ablation of atrioventricular node in 2 female pigs (mean body weight: 62 kg). Under general anesthesia, direct right femoral venous cutdown was performed and an 8 F sheath was inserted. An 8F mapping catheter (NOGA-STAR) was inserted and a 3D reconstruction of the right atrium with performed using the NOGA system. The position of the His bundle was identified by the recording of the local electrogram and was tagged. Then a novel direct myocardial injection catheter (MYO-STAR), which embedded with a self retractable needle for injection, was inserted and navigated to the His bundle region as guided by the 3D NOGA map. After confirming the stable contact of the catheter tip with the myocardium, the needle was protruded and 0.1 cc of mixture of 95% alcohol and ink was injected into the His bundle for chemical ablation. Successful complete atrioventricular nodal ablation with complete heart block was achieved in two pigs using only 2 and 6 injections, respectively. No acute complication was observed. Postmortem examination confirmed the accurate site of injections at the His bundle. **Conclusion:** This is the first experiment to demonstrate that non-fluoroscopic magnetic electroanatomic mapping guided direct alcohol ablation of myocardial tissue is effective and should be considered as a potential valuable adjunct to those arrhythmias which refractory to standard catheter ablation technique. However, future research will be required to investigate the long term safety and efficacy of this novel catheter-based ablation technique.