Validation of non-invasive electrophysiological mapping accuracy using endocardial pacing with Three-Dimensional Non-Fluoroscopic Electroanatomic Mapping

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Introduction: Preoperative non-invasive diagnosis of ventricular arrhythmias allows to predict the effectiveness of ablation, reduces the operation and radiation exposure time. Previous studies based on comparison of the early activation zone (EAZ) with the anatomic location of the pacemaker's tip showed high accuracy of noninvasive mapping in place of pacemaker implantation. But other anatomical areas accuracy is still unclear.

Aim: To determine the accuracy of non-invasive mapping and examine the excitation patterns by endocardial ventricular pacing of different areas of myocardium with 3D Non-Fluoroscopic Electroanatomic Mapping.

Methods: 27-years old man with indications for VT ablation underwent noninvasive electrophysiological mapping with computed tomography using "Amycard 01C EP lab" system (EP Solutions SA, Switzerland). Interoperation pacing in 27 points of the ventricles endocardium (11-in LV, 16-in RV) was performed with Carto 3 system (Biosense Webster,Inc.,US) according to standard anatomical segments scheme and each pacing point coordinates were determined and marked. Epi and endocardial isopotential FND and activation maps were created with "Amycard01C EP LAB". Data from invasive and non-invasive mapping were uploaded into custom written software with Python Software and fused using the iterative closest point algorithm. Both quantitative and qualitative comparisons were performed. Statistical analysis was performed using Statistica v.12(Statsoft Inc.,USA).

Results: The EAZ was located with sufficient accuracy. Maps weren't completely identical but main activation patters were similar. Best result was obtain for RVOT septal and lateral segments, apical, anterior, lateral-basal segments of RV, lateral-basal, lateral-middle, inferior-basal, inferior-apical segments of LV.

Conclusions: Ventricular pacing of different myocardium areas allows expanding the validation group, to evaluate the non-invasive mapping accuracy and excitation patterns including patients with scars and fibrosis. Comparing of real endocardial and reconstructed electrograms for each pacing point can help to improve inverse ECG problem and topical diagnosis of PVCs, create database for further modeling studies.