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Bipolar voltage cut-off validation in electroanatomical voltage mapping to identify scar and conduction channels in ventricular tachycardia ablation: need for new cut-off in NICM

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Background/Introduction

Substrate-guided techniques have changed the approach and results of ventricular tachycardia (VT) ablation and electroanatomical voltage mapping (EAVM) constitutes a diagnostic and therapeutic cornerstone in this field. In current practice normal myocardium is typically characterized by bipolar voltage > 1.5 mV, dense scar < 0.5 mV, and border zone (BZ) tissue by the range between 0.5 to 1.5 mV. Of note, evidence for these cut-off values has been derived in humans from small observational studies and in animals. Furthermore, some studies suggest that only the 60% of not transmural endocardial scars and the 35% of not endocardial scars are detected without any adjustment of these values. New voltage cut-off values are needed.

Purpose: The purpose of this study is to adjust voltage cut off in order to establish the threshold that more accurately define the pathological substrate in VT ablation. Additionally, predictors of usefulness of current thresholds are analyzed.

Methods: EAVM were created with CARTO3 System and Sensor-Force catheter (Navistar Smart-Touch and Pentaray). We delineated the conducting channels by analyzing the late potentials activation. Based on these channels we looked for the best cut-off values to detect these channels. We describe the baseline characteristics, the best cut-off values for border zone and scar core in our series and we analyzed the accuracy of the current established values to detect the arrhythmogenic VT substrate

Results: We investigated 51 patients (74,5% males; 41,2% ischemic cardiomyopathy, mean LVEF 38,6% +/-13,6) with sustained monomorphic VT submitted to ablation during 2016 and 2017. The range of the voltage adjustment was from 0,01-1 mV for core area and 0,2-6mV as maximum, with an average of 0,31-1,42mV. Using currently accepted bipolar voltage cut-off <0.5 mV the core scar was correctly identified in 80,4% of patients: 90,4% in ischemic and 73,3% in NICM. Regarding BZ, using classical cut off (0.5-1.5mV) only 56,9 % of the cases were well identified: interestingly, accuracy was worse in NICM (46,6%) than in ischemic patients (71,4%) (p = 0,07).

Conclusions EAVM is very important to detect scar and channels in VT ablation, but several elements can affect it and recently the traditional voltage values have been questioned. Our study suggests how the threshold as currently applied in daily practice could be acceptable to detect the core scar area, but it has to be reconsidered in NICM, especially regarding the border zone. An evident trend (p = 0,07) suggests a better accuracy of current values to define VT substrate in ischemic patients than in NICM.

Abstract Figure. Channel Identification