

# Impact of a formula combining local impedance and conventional parameters on lesion size prediction

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## Abstract

Background: Although ablation energy (AE) and force-time integral (FTI) are well-known active predictors of lesion characteristics, these parameters do not reflect passive tissue reactions during ablation, which may instead be represented by drops in local impedance (LI). This study aimed to investigate if additional LI-data improves predicting lesion characteristics and steam-pops. Methods: RF applications at a range of powers (30W, 40W, and 50W), contact forces (8g, 15g, 25g, and 35g), and durations (10-180s) using perpendicular/parallel catheter orientations, were performed in excised porcine hearts (N=30). The correlation between AE, FTI and lesion characteristics was examined and the impact of LI (%LI-drop [%LID] defined by the  $\Delta LI / \text{Initial LI}$ ) was additionally assessed. Results: 375 lesions without steam-pops were examined. Ablation energy (W\*s) and FTI (g\*s) showed a positive correlation with lesion depth ( $\rho=0.824:P<0.0001$  and  $\rho=0.708:P<0.0001$ ), surface area ( $\rho=0.507:P<0.0001$  and  $\rho=0.562:P<0.0001$ ) and volume ( $\rho=0.807:P<0.0001$  and  $\rho=0.685:P<0.0001$ ). %LID also showed positive correlation individually with lesion depth ( $\rho=0.643:P<0.0001$ ), surface area ( $\rho=0.547:P<0.0001$ ) and volume ( $\rho=0.733, P<0.0001$ ). However, the combined indices of AE\*%LID and FTI\*%LID provided significantly stronger correlation with lesion depth ( $\rho=0.834:P<0.0001$  and  $\rho=0.809P<0.0001$ ), surface area ( $\rho=0.529:P<0.0001$  and  $\rho=0.656:P<0.0001$ ) and volume ( $\rho=0.864:P<0.0001$  and  $\rho=0.838:P<0.0001$ ). This tendency was observed regardless of the catheter placement (parallel/perpendicular). AE (P=0.02) and %LID (P=0.002) independently remained as significant predictors to predict steam-pops (N=27). However, the AE\*%LID did not increase the predictive power of steam-pops compared to the AE alone. Conclusion: LI, when combined with conventional parameters (AE and FTI), may provide stronger correlation with lesion characteristics.

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