Background: There is limited data on use of pulsed field ablation (PFA) in the left ventricle (LV), particularly in the presence of myocardial scar
Objective: To evaluate the lesion characteristics of PFA and radiofrequency energy (RFA) in healthy and infarcted LV myocardium
Methods: 10 swine were included: 8 underwent 120min LAD balloon occlusion myocardial infarction and were survived for 6-8 weeks; 2 were healthy controls. PFA and standard RFA was delivered to the LV endocardium in healthy myocardium or scar identified with electroanatomic mapping. Bipolar, biphasic PFA was delivered at 1800 to 2000V for 2.5secs x 4 applications/site using 2 different catheters: linear quadripolar (LINEAR) or multi-spline 8-pole catheter (BASKET). Irrigated RF energy was delivered from 35W-50W to achieve >10 ohm impedance drop. Detailed histologic measurements of ablation depth were performed.
Results: In the PFA group, 21 lesions were delivered to healthy LV and 20 to scar, all without complications. There was no significant difference in histologic lesion depth in healthy myocardium or scar between LINEAR vs. BASKET PFA catheters (Figure A). In the RF group, 19 lesions were delivered to healthy LV and 8 to scar. Maximal lesion depth for PFA and RFA were similar in healthy tissue, however lesion depth was greater for PFA than RFA in scar (Figure B, 6.1 ± 1.7 vs 3.8 ± 1.7 mm; P = 0.005). There was no vascular injury observed with PFA, however RFA led to adventitial edema and thrombosis.
Conclusion: PFA allows rapid, safe and effective ablation of surviving islands of myocardium within infarcted LV substrate. Lesion depth in myocardial scar is greater for PFA than RFA. This technology holds promise for treating infarct-related ventricular tachycardia in humans.