Lesion size and adjacent tissue damage assessment with high power and short duration atrial ablation: comparison to usual radiofrequency ablation power setting

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Introduction: There is increased interest in creating high-power short duration (HPSD) atrial ablation lesions in the field of AF ablation. However, lesion size and adjacent tissue damage assessment with HPSD ablation is not fully elucidated. The purpose of the study was to evaluate lesion size and collateral damage using two separate ablation protocols setting (HPSD: 50w/7seconds vs Control: 25W/30seconds).

Methods: Thirteen freshly killed porcine hearts were obtained, and the atrium were harvested for ablation. The atriums were placed in a tissue bath with circulating 0.45% NaCl at maintained temperature 37°C (figure A). To assess the collateral damage, the ventricle tissues were placed under the atrium tissue (figure B). Radiofrequency ablation (RFA) with 4mm tip irrigated, force sensing catheter was performed. All lesions were ablated under recording the impedance, power, temperature, contact force (gram) and lesion size index (LSI) using with Ensite Navx system. After RFA, lesion size was assessed for each lesions.

Result: Fifteen lesions were made for each ablation protocol (total 30 lesions). Ablation parameters were similar between two groups (HPSD vs Control; impedance drop(Ω): 30.2±5.4 vs 33.6±7.8 P=0.18, average temperature(℃): 38.4±2.6 vs 36.8±1.8, P=0.17, contact force(g): 16.4±6.7 vs 14.2±2.7, P=0.12, LSI: 5.24±0.6 vs 5.31±0.6 P=0.61). Histological examination was performed and all lesions were noted to be transmural. Lesion characteristics were similar between 2 groups (figure C: HPSD vs Control; volume: 22.6±8.4 mm³ vs 24.8±8.6 mm³ P=0.48, diameter: 4.21±0.6mm vs 3.86±0.6mm P=0.15, depth: 1.67±0.5mm vs 2.17±0.8mm P=0.06). Adjacent tissue damages were more frequent seen in control group (figure D: HPSD vs Control; 0/15 (0%) vs 3/15 (20%), P=0.034).

Conclusion: Effective lesions were made with HPSD, thereby reducing RFA procedure time. The lesion characteristics with HPSD ablation was shallower and wider compared to usual RFA power setting in atria. Although the lesion volume were similar between 2 groups, collateral damage were less seen in HPSD group.