Conclusion: It is important to screen all possible paced morphologies from both the atrial and ventricular chambers to prevent S-ICD oversensing when concurrent devices are in situ.

AP-518-03

NO PAIN, ALL GAIN: S-ICD INSERTION WITH REGIONAL ANESTHESIA BLOCK SHOWS PERI-PROCEDURAL BENEFITS
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Background: The subcutaneous implantable cardioverter-defibrillator (S-ICD) was FDA approved in 2009 as the first extracardiac device. Because the implant procedure includes creating a pocket along the latissimus dorsi muscle, tunneling of the defibrillator lead and DFT testing, intra and post operative pain control is an important consideration.

Objective: To assess the anesthetic requirement, post-operative opiate use, hospital length of stay (LOS) and effect on DFT testing with S-ICD implantation done with a serratus anterior and subpectoral parasternal regional pain block (RPB) and systemic anesthesia versus those done with systemic anesthesia alone.

Methods: We performed a serratus anterior and subpectoral parasternal RPB on 20 patients (pts) presenting for a S-ICD implantation or generator change over the last 17 months. We monitored the pts post-operative opiate requirement, hospital LOS and shock impedance/defibrillation threshold test success.

Results: Between June 2020 and Nov 2021, a total of 52 pts underwent S-ICD implant or generator change. Of these pts, 20 underwent a RPB in conjunction with the procedure. The patients who underwent RPB were more likely to be done under monitored anesthesia than pts in the non-RPB group (75% vs 13%). In addition, less post-operative opiate use was seen in the RPB group, 40% requiring PO opiates vs 53% in the non-RPB group and 20% requiring IV opiates vs 38%, respectively. The total procedural time for both groups were similar at 2:33 (+/-3) in the RPB group and 2:25 (+/-3) in the non-RPB group. The same day discharge (SDD) success was higher in the RPB group with 40% success vs 13% in the non-RPB group. DFT testing in the RPB arm was performed on 15 pts and successful in 93%. One patient failed DFT testing which led to subsequent placement of the ICD generator more posterior. The hospital LOS on non-inpatients was similar in the RPB group and non-RPB group 0.63 day (+/- 0.59) vs 0.82 days (+/-0.86).

Conclusion: Regional pain blocks used concomitantly with S-ICD implantation or generator change showed less anesthetic requirement, decreased pain and opiate requirement in the postoperative period, improved SDD success and unchanged DFT testing and impedances. This approach has shown favorable effects on patient experience while maintaining patient safety.

AP-518-04

INCIDENCE OF INAPPROPRIATE SHOCK IN PATIENTS WITH SUBCUTANEOUS IMPLANTABLE CARDIOVERTER-DEFIBRILLATORS WITH CONCOMITANT CARDIAC IMPLANTABLE ELECTRONIC DEVICES: A SINGLE-CENTER COHORT STUDY
Makiko Okazaki; Takahiko Nagase MD; Kanki Inoue MD; Harumi Yamada and Kei Mabuchi MD

Background: The subcutaneous implantable cardioverter-defibrillator (S-ICD) system does not require the placement of intracardiac instrumentation. Therefore, S-ICDs avoid adverse events related to the implantation of a transvenous implantable cardioverter-defibrillator system. However, as S-ICDs do not have a pacing function, an additional implanted device is required for patients who are clinically indicated for a S-ICD and require pacing therapy. It is unclear whether the incidence of inappropriate shock is increased in patients with S-ICDs with concomitant cardiac implantable electronic devices (CIEDs).

Objective: This study aimed to compare the incidence of inappropriate shock in patients with S-ICDs with and without concomitant CIEDs.

Methods: The study cohort comprised 127 patients who underwent S-ICD implantation at our institution between February 2016 and October 2020. Patients were classified as the combined group who simultaneously received S-ICDs and other CIEDs, and the non-combined group who received only S-ICDs. Some patients changed groups during the study because they received CIEDs after S-ICD implantation. To account for these group changes, we used a time-varying Kaplan-Meier curve and Cox proportional hazards model to compare the incidence of inappropriate shock between the two groups.

Results: There were 21 patients in the combined group and 106 patients in the non-combined group at the time of S-ICD implantation. Five patients received other CIEDs after S-ICD implantation. The median follow-up period was 935 days in the combined group and 798 days in the non-combined group. The number of events was three in the combined group and 12 in the non-combined group. The incidence of inappropriate shock did not differ between the two groups (hazard ratio 1.17, 95% confidence interval 0.31-4.32, P = 0.81).

Conclusion: The incidence of inappropriate shock was slightly increased in patients with S-ICDs and other CIEDs versus those with S-ICDs alone, but this intergroup difference was not significant. This study represents our single-center experience in a small cohort. Multicenter studies with large sample sizes are needed to assess the impact of other CIEDs in combination with S-ICDs.

ABSTRACT CA-534:
Effects of Pulse Field Ablation on Ventricular Myocardium and Coronary Arteries

Saturday, April 30, 2022
3:30 PM - 4:30 PM

CA-534-01

PULSED FIELD ABLATION COMPARED TO RADIOFREQUENCY ABLATION OF LEFT VENTRICULAR MYOCARDIUM IN A SWINE INFARCT MODEL
Sung Il Im MD; Satoshi Higuchi MD and Edward P. Gerstenfeld MD, FHRS
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 quadrripolar (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.

CA-534-02

A NOVEL SINGLE-SHOT PULSED FIELD ABLATION SYSTEM IS ASSOCIATED WITH LARGE AND DURABLE VENTRICULAR LESIONS IN VIVO: A PRECLINICAL ASSESSMENT OF SAFETY AND EFFICACY

Arash Aryana MD, PhD, FHRS; Dorin Panescu BSEE, MSE, PhD; Cary Hata BS; Alan De La Rama BS; Ken Nguyen BS and Andre d’Avila MD, PhD

Background: Pulsed field ablation (PFA) is a non-thermal ablative strategy that achieves cell death via electroporation.

Objective: We investigated the preclinical safety and efficacy of PFA using 3 novel PFA/mapping catheters (CRC EP Inc, San Jose, CA).

Methods: In total, 14 pulsed field applications were delivered in 5 swine under general anesthesia without paralytic agents, including: 7 lesions in the RV and 7 in the LV. The PFA catheter designs consisted of an 8-Fr, 16-electrode, bidirectional, 25-, 30- or 35-mm spiral. The 2 larger catheters had 2 distal mapping electrode pairs. The catheters were inserted through 8.5-Fr steerable introducers. Bipolar PFA (2.5-4.0 kV) was performed using single-shot, QRS-gated applications under intracardiac echocardiographic guidance. The intensity of skeletal muscle activation was quantified using an accelerometer (Phyphox, Aachen, Germany). Lesions were assessed by pre- versus post-EGM analysis, pacing threshold, 3D voltage mapping (EnSite, Abbott, Chicago, IL), necropsy, and histology. The swine rete mirabile and the kidneys were examined to investigate for embolic events related to PFA.

Results: All applications were single-shot (56 ± 18 s) without repositioning the catheter. Minimal microbubbling was observed with no skeletal muscle stimulation - acceleration <0.5 m/s² (noise level). No tachyarrhythmias were induced during PFA. There was marked reduction in post- versus pre-PFA EGMs (0.5 ± 0.2 mV versus 2.0 ± 0.9 mV, P <0.001) and increase in pacing threshold (>20 mA versus 7.5 ± 2.9 mA, P <0.001). All lesions were large and durable up to 28 days of follow-up. The lesions measured: 32.1 ± 4.7 mm (length), 26.6 ± 7.8 mm (width), 8.4 ± 3.1 mm (depth), 62.9 ± 2.1 mm (circumference) and 10.5 ± 3.7 cm³ (volume). Despite the higher waveform voltage and prolonged applications used, no significant thermal effects were detected at necropsy or histology. Moreover, gross and microscopic examinations of the rete mirabile and the kidneys revealed no evidence of thromboembolism in any of the animals.

Conclusion: A novel PFA catheter system can create large and durable ventricular lesions using single-shot, 56-sec applications in vivo. Despite the presence of minimal microbubbles, examination of the rete mirabile and the kidneys revealed no thromboembolic events in any of the animals.

CA-534-03

INVESTIGATING PULSED FIELD (PFA) VS RADIOFREQUENCY ABLATION (RFA) LESION CHARACTERISTICS IN AN IN VIVO HEALTHY PORCINE LEFT VENTRICLE (LV) USING 3D LGE AND NATIVE T1W MAGNETIC RESONANCE IMAGING (MRI)

Terenz Escartin; Maria Terricabras MD; Philippa R.P. Krahn PhD; Jennifer Barry; Melissa Larsen; Nicolas Coulombe MS; Lars M. Mattison PhD; Bor Kos; Matej Kranjc; Jernej Stublar; Daniel Sigg MD, PhD; Mark T. Stewart BSME; Damijan Miklavcic PhD; Atul Verna MD, FHRS and Graham Wright MASC, PhD

Background: PFA is an emerging largely non-thermal method of ablation. Recently, it was shown in an in vivo porcine model that increasing the number of trains resulted in larger PFA lesions. However, it remains unclear how PFA lesions mature over time.

Objective: Use native T1-weighted (T1w) and 3D late gadolinium enhancement (LGE) MRI to investigate temporal changes in PFA lesion characteristics in an in vivo healthy porcine LV in comparison to RFA lesions.

Methods: PFA was performed in 8 swine via an 8F, 5mm tip focal catheter setup and R-wave gated biphasic pulse trains of 1500 V (1, 4, 8, and 16 trains). N=6 lesions for each biphasic pulse train number were analyzed. Native T1w and 3D LGE (Gadovist, 0.2 mmol/kg) were acquired at 24 hours (acute), 1 week (subacute) and 6-7 weeks (chronic) post-ablation. RFA was performed in 2 swine using a 3.5 mm tip catheter (SF Thermocoool) with MRI acquired at similar timepoints. PFA lesion depths were measured as the max straight-line distance starting from the endocardium using short-axis 3D LGE images.

Results: Native T1w showed no hyperintensity at the PFA lesion locations suggesting the absence of lethal thermal effects, which are easily observed with RFA (Fig. 1). LGE indicated microvascular obstruction (MVO) in 2/24 PFA lesions at 24hrs only at the highest dosage, while MVO is common in RFA. LGE also indicated regions of increased gadolinium distribution with PFA at 24 hrs that diminished at 1-week. More generally, PFA lesion depth increased with number of trains and decreased as...