



FARAPULSE™
Pulsed Field Ablation System

Clinical compendium



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CLINICAL PUBLICATIONS

2021

Does pulsed field ablation regress over time? A quantitative temporal analysis of pulmonary vein isolation

Kawamura I, Neuzil P, Shrivamurthy P, et al.

Heart Rhythm (June 2021), available at: [doi: 10.1016/j.hrthm.2021.02.020](https://doi.org/10.1016/j.hrthm.2021.02.020)

- Patients with paroxysmal atrial fibrillation underwent PVI using a biphasic PFA waveform delivered through a dedicated, variably deployable multielectrode basket/flower catheter.
- A comparison of voltage maps immediately after PFA and at a median of 84 days (interquartile range 69–90 days) later revealed that there was no significant difference in either the left and right-sided PV antral isolation areas or nonablated posterior wall area.
- The distances between low-voltage edges on the posterior wall were also not significantly different between the 2 time points.

KEY TAKEAWAY: In this study, the level of PV antral isolation after PFA with a multielectrode PFA catheter persists without regression.

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Pulsed field ablation prevents chronic atrial fibrotic changes and restrictive mechanics after catheter ablation for atrial fibrillation

Nakatani Y, Sridi-Cheniti S, Cheniti G, et al.

Europace (May 2021), available at: [doi:10.1093/europace/euab155](https://doi.org/10.1093/europace/euab155)

- Cardiac magnetic resonance was performed pre-ablation, acutely (<3 h), and 3 months post-ablation in 41 patients with paroxysmal atrial fibrillation (AF) undergoing pulmonary vein (PV) isolation with PFA (n = 18) or thermal ablation (n = 23, 16 radiofrequency ablations, 7 cryoballoon ablations).
- Tissue changes were more homogeneous after PFA than after thermal ablation, with no sign of microvascular damage or intramural hemorrhage. In the chronic stage, the majority of acute LGE had disappeared after PFA, whereas most LGE persisted after thermal ablation.
- The maximum strain on PV antra, the LA expansion index, and LA active emptying fraction declined acutely after both PFA and thermal ablation but recovered at the chronic stage only with PFA.

KEY TAKEAWAY: In this study, pulsed field ablation induces large acute LGE without microvascular damage or intramural hemorrhage. Most LGE lesions disappear in the chronic stage, suggesting a specific reparative process involving less chronic fibrosis.

Pulsed Field Ablation of Paroxysmal Atrial Fibrillation: 1-Year Outcomes of IMPULSE, PEFCAT, and PEFCAT II

Reddy VY, Dukkipati SR, Neuzil P, et al.

JACC-EP (May 2021), available at: doi.org/10.1016/j.jacep.2021.02.014

- In 3 multicenter studies (IMPULSE, PEFCAT and PEFCAT II), paroxysmal atrial fibrillation patients underwent PVI using a basket and flower PFA catheter.
- Invasive remapping was performed at 2 to 3 months, and reconnected PVs were reisolated with PFA or radiofrequency ablation. After a 90-day blanking period, arrhythmia recurrence was assessed over 1-year follow-up.
- In 121 patients, acute PVI was achieved in 100% of PVs with PFA alone. PV remapping, performed in 110 patients at 93.0 ± 30.1 days, demonstrated durable PVI in 84.8% of PVs (64.5% of patients), and 96.0% of PVs (84.1% of patients) treated with the optimized biphasic energy PFA waveform.
- The 1-year Kaplan-Meier estimates for freedom from any atrial arrhythmia for the entire cohort and for the optimized biphasic energy PFA waveform cohort were $78.5 \pm 3.8\%$ and $84.5 \pm 5.4\%$, respectively.

KEY TAKEAWAY: In this study, PVI with a “variable distal end morphology” PFA catheter results in excellent PVI durability and acceptable safety with a low 1-year rate of atrial arrhythmia recurrence.

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How does the level of pulmonary venous isolation compare between pulsed field ablation and thermal energy ablation (radiofrequency, cryo, or laser)?

Kawamura I, Neuzil P, Shivamurthy P, et al.

Europace (May 2021), available at: [doi:10.1093/europace/euab150](https://doi.org/10.1093/europace/euab150)

- In a clinical trial (NCT03714178), paroxysmal atrial fibrillation (PAF) patients underwent PVI with a multi-electrode pentaspline PFA catheter using a biphasic waveform, and after 75 days, detailed voltage maps were created during protocol-specified remapping studies.
- Comparative voltage mapping data were retrospectively collected from consecutive PAF patients who (i) underwent PVI using thermal energy, (ii) underwent reablation for recurrence, and (iii) had durably isolated PVs. The left and right PV antral isolation areas and non-ablated posterior wall were quantified.
- There was no significant difference between the PFA and thermal ablation cohorts in either the left- and right-sided PV isolation areas, or the non-ablated posterior wall area.

KEY TAKEAWAY: In this study, catheter-based PVI with the pentaspline PFA catheter creates chronic PV antral isolation areas as encompassing as thermal energy ablation.

Pulsed field ablation selectively spares the oesophagus during pulmonary vein isolation for atrial fibrillation

Cochet H, Nakatani Y, Sridi-Cheniti S, et al.

Europace (February 2021), [available at: doi:10.1093/europace/euab090](https://doi.org/10.1093/europace/euab090)

- Cardiac magnetic resonance (CMR) imaging was performed before, acutely (<3 h) and 3 months post-ablation in 41 paroxysmal AF patients undergoing PVI with PFA (N= 18, FARAPULSE) or thermal methods (N= 23, 16 radiofrequency, 7 cryoballoon).
- Oesophageal and aortic injuries were assessed by using late gadolinium-enhanced (LGE) imaging. Phrenic nerve injuries were assessed from diaphragmatic motion on intra-procedural fluoroscopy.
- Acutely, thermal methods induced high rates of oesophageal lesions (43%), all observed in patients showing direct contact between the oesophagus and the ablation sites. Oesophageal lesions were observed in no patient ablated with PFA (0%, $P < 0.001$ vs. thermal methods), despite similar rates of direct contact between the oesophagus and the ablation sites ($P = 0.41$). Acute lesions were detected on CMR on the descending aorta in 10/23 (43%) after thermal ablation, and in 6/18 (33%) after PFA ($P = 0.52$). CMR at 3 months showed a complete resolution of oesophageal and aortic LGE in all patients.

KEY TAKEAWAY: [In this study, PFA does not induce any signs of oesophageal injury on CMR after PVI. Due to its tissue selectivity, PFA may improve safety for catheter ablation of AF.](#)

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Pulsed Field Ablation: A Promise that came true

Ante A, Breskovic T, Sikiric I.

Current Opinion in Cardiology (Jan 2021), available at: [DOI: 10.1097/HCO.0000000000000810](https://doi.org/10.1097/HCO.0000000000000810)

- Pulsed field ablation is a nonthermal ablative modality that uses short living, strong electrical field created around catheter to create microscopic pores in cell membranes (electroporation). When adequately dosed/ configured it shows a preference for myocardial tissue necrosis. Thus, it holds a promise to become a 'perfect' energy source for cardiac ablation to treat arrhythmias.
- First in human series using pulsed field ablation for atrial fibrillation ablation have been completed and data published for several platforms. Acute safety outcomes are similar across the platforms with exceptionally low rate of those complications that are typically reported for thermal ablation methods (oesophageal injury, pulmonary vein stenosis, phrenic nerve palsy). Promising acute data on pulmonary vein isolation had been corroborated with satisfactory 1-year clinical follow-up for a single platform (i.e. FARAPULSE), whereas reports are pending for the rest. Research efforts are being expanded to a development of focal catheters, and therefore, pulsed field ablation application for ventricular arrhythmias.
- As the reports confirming its safety and efficacy build up, there seems to be no way that the promise of pulsed field ablation could end in a blind alley.

KEY TAKEAWAY: [Promising intraprocedural PFA results for atrial fibrillation ablation had recently been supported by 1-year clinical follow-up data with the pleasing success rate. It is likely that PFA with a circumferential lesion catheter design will become the dominant modality for PVI in the foreseeable future. True focal PFA, with solid tip catheters is being investigated in animal labs while we still await FIH reports. This will provide ability to widen the application for ventricular arrhythmias ablation.](#)

2020

Pulsed Field Ablation in Patients with Persistent Atrial Fibrillation

Reddy VY, Anic A, Koruth J, et al.

JACC (Sep 2020), available at: <https://doi.org/10.1016/j.jacc.2020.07.007>

- PersAFOne is a single-arm study evaluating biphasic, bipolar PFA using a multispline catheter for PVI and LAPW ablation to assess the safety and lesion durability of pulsed field ablation (PFA) for both PVI and LAPW ablation in persistent AF.
- In 25 patients, acute PVI (96 of 96 pulmonary veins) were 100% acutely successful with the multispline PFA catheter alone. Using the focal PFA catheter, acute cavotri cuspid isthmus block was achieved in 13 of 13 patients.
- Post-procedure esophagogastroduodenoscopy and repeat cardiac computed tomography revealed no mucosal lesions or PV narrowing, respectively. Invasive remapping at 2 to 3 months demonstrated durable isolation (defined by entrance block) in 82 of 85 PVs (96%) and 21 of 21 LAPWs (100%) treated with the pentaspline catheter.

KEY TAKEAWAY: In this study, the unique safety profile of PFA potentiated efficient, safe, and durable PVI and LAPW ablation. This extends the potential role of PFA beyond paroxysmal to persistent forms of AF. Lesion reassessments at 3 months revealed durable lesions.

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Ostial dimensional changes after pulmonary vein isolation: Pulsed field ablation vs radiofrequency ablation

Kuroki K, Whang W, Eggert C, et al.

Heart Rhythm 2020 May, available at: doi.org/10.1016/j.hrthm.2020.04.040

- Data were analyzed from 4 paroxysmal atrial fibrillation ablation trials using either PFA or RFA.
- Baseline and 3-month cardiac computed tomography scans were reconstructed into 3-dimensional images, and the long and short axes of the PV ostia were quantitatively and qualitatively assessed in a randomized blinded manner.
- PV ostial diameters decreased significantly less with PFA than with RFA (% change; long axis: 0.9% ± 8.5% vs -11.9% ± 16.3%; P < .001 and short axis: 3.4% ± 12.7% vs -12.9% ± 18.5%; P < .001).
- PV narrowing/stenosis was present in 0% and 0% vs 12.0% and 32.5% of PVs and patients who underwent PFA and RFA, respectively.

KEY TAKEAWAY: In this study, unlike after RFA, the incidence and severity of PV narrowing/stenosis after PV isolation is virtually eliminated with PFA.

2019

Pulsed Field Ablation for Pulmonary Vein Isolation in Atrial Fibrillation

Reddy VY, Neuzil P, Koruth JS, et al.

JACC (Jul 2019), available at: <https://doi.org/10.1016/j.jacc.2019.04.021>

- Two trials were conducted to determine whether PFA allows durable pulmonary vein (PV) isolation without damage to collateral structures, in patients with paroxysmal atrial fibrillation.
- Ablation was performed using proprietary bipolar PFA waveforms: either monophasic with general anesthesia and paralytics to minimize muscle contraction, or biphasic with sedation because there was minimal muscular stimulation. Noesophageal protection strategy was used. Invasive electrophysiological mapping was repeated after 3 months to assess the durability of PV isolation.
- 81 patients, all PVs were acutely isolated by monophasic (n=15) or biphasic (n=66) PFA. With successive waveform refinement, durability at 3 months improved from 18% to 100% of patients with all PVs isolated. Beyond 1 procedure-related pericardial tamponade no additional primary adverse events over the 120-day median follow-up, including: stroke, phrenic nerve injury, PV stenosis, and esophageal injury.

KEY TAKEAWAY: In this study, FARAPULSE PFA preferentially affected myocardial tissue, allowing facile ultra-rapid PV isolation with excellent durability (3 months remapping) and chronic safety.

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2018

Ablation of Atrial Fibrillation with Pulsed Electric Fields

Reddy VY, Koruth J, et al.

JACC-EP (Apr 2018), available at: <https://doi.org/10.1016/j.jacep.2018.04.005>

- First acute clinical experience of atrial fibrillation ablation with PFA, both epicardial box lesions during cardiac surgery, and catheter-based PV isolation.
- PFA was performed using a custom over-the-wire endocardial catheter for percutaneous transeptal PV isolation, and a linear catheter for encircling the PVs and posterior left atrium during concomitant cardiac surgery.
- Catheter PV ablation was successful in 15 patients (100%) 57 PVs Using 3.26 lesions/PV and surgical box lesions were successful in 6 of 7 patients (86%) 2 lesions/patient. No complications.

KEY TAKEAWAY: In this study, ultrarapid PFA-based PV and LA ablation is both feasible and safe and is associated with excellent acute efficacy.

PRECLINICAL PUBLICATIONS

2020

Pulsed Field Ablation vs Radiofrequency Ablation: Esophageal Effects in a Novel Preclinical Model

Koruth JS, Kuroki K, Kawamura I, et al.

Circulation: Arrhythmia and Electrophysiology (Jan 2020), available at:

<https://doi.org/10.1161/CIRCEP.119.008303>

- A novel preclinical model was created to nonsurgically assess the response to esophageal injury. This was accomplished by delivering the energy source from within the inferior vena cava, against the esophagus (which was purposefully mechanically deviated towards the IVC).
- Biphasic pulsed field ablation induced no chronic histopathologic esophageal changes, whereas radiofrequency catheter ablation demonstrated a spectrum of esophageal lesions including esophageal ulcers, abscess, and fistula.

KEY TAKEAWAY: Dr. Koruth et al describe a novel porcine model simulating clinical conditions for esophageal damage caused by endocardial ablation. Six subjects treated with FARAPULSE PFA revealed no esophageal injury while radiofrequency ablation caused grossly observable and severe injury.

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2019

Preclinical Evaluation of Pulsed Field Ablation: Electrophysiological and Histological Assessment of Thoracic Vein Isolation

Koruth JS, Kuroki K, Iwasawa J, et al.

Circulation: Arrhythmia and Electrophysiology (Dec 2019), available at:

<https://doi.org/10.1161/CIRCEP.119.007781>

- In this study, the safety, efficacy, and durability of achieving catheter-based electrical isolation of PVI using optimized monophasic and biphasic PFA waveforms and describe procedural and histological characteristics of PFA in swine atrial tissue.
- Both waveforms created confluent myocardial lesions that demonstrated a myocardial-specific ablative effect.
- Biphasic PFA was more durable than monophasic PFA and radiofrequency ablation lesions.

KEY TAKEAWAY: Dr. Koruth et al compares lesion durability and collateral injury following preclinical pulmonary vein isolation with FARAPULSE PFA (monophasic and biphasic) and radiofrequency. Nerve and PV damage was observed only with radiofrequency ablation and biphasic PFA yielded optimal lesion durability among the three cohorts.

Endocardial Ventricular Pulsed Field Ablation: A Proof-of-Concept Preclinical Evaluation

Koruth JS, Kuroki K, Iwasawa J, et al.

EP Europace (Dec 2019), available at: <https://doi.org/10.1093/europace/euz341>

- Assessment of safety and feasibility of FARAPULSE PFA in swine ventricles with a prototype steerable endocardial catheter.
- Gross measurements, available for 28 of 30 ablation sites, revealed average lesion dimensions to be 6.5 ± 1.7 mm deep and 22.6 ± 4.1 mm, with a maximum depth and width of 9.4 mm and 28.6mm respectively.
- In PFA lesions, fibrous tissue homogeneously replaced myocytes without overlying thrombus. When present in the lesion zone, nerve fascicles and vasculature were preserved.

KEY TAKEAWAY: Report on a series of porcine subjects treated with the novel FARAPULSE FARAFLEX focal PFA catheter. Ventricular tissue targeted for ablation demonstrated lesions with clinically relevant dimensions and spared collateral structures such as vasculature and nerves.

ABSTRACTS

2021

Cerebral safety after pulsed field ablation for symptomatic atrial fibrillation ablation

Reinsch N, Fueting AV, Höwel D, et al.

Clin Res Cardiol (2021). 10.1007/s00392-021-01933-9

Pulsed field ablation for atrial fibrillation is safe for the bronchial system

Höwel D, Fueting AV, Reinsch N, et al.

Clin Res Cardiol (2021). 10.1007/s00392-021-01933-9

Patient discomfort following pulsed field ablation for paroxysmal atrial fibrillation - an assessment of chest and groin pain using Numeric Rating Scale

Füting A, Neven K, Höwel D, et al.

Clin Res Cardiol (2021). 10.1007/s00392-021-01933-9

Cardiac enzyme kinetics as marker for myocardial damage after pulsed field ablation for paroxysmal atrial fibrillation

Reinsch N, Füting A, Höwel D, et al.

Clin Res Cardiol (2021). 10.1007/s00392-021-01933-9

First real-world experience with pulmonary vein isolation using pulsed field ablation for paroxysmal atrial fibrillation

Neven K, Füting A, Höwel D, et al.

Clin Res Cardiol (2021). 10.1007/s00392-021-01933-9

Pulsed field ablation for atrial fibrillation is safe for the esophagus

Höwel D, Fueting AV, Reinsch N, et al.

Clin Res Cardiol (2021). 10.1007/s00392-021-01933-9

First insights of pulsed-field ablation based pulmonary vein isolation: a real world single-center experience

Lemoine M, Schleberger, Münkler P, et al.

Clin Res Cardiol (2021). 10.1007/s00392-021-01933-9

Pulsed field ablation in patients undergoing catheter ablation for atrial fibrillation: initial experience

Gunawardene MA, Schäffer B, Jularic M, et al.

Clin Res Cardiol (2021). 10.1007/s00392-021-01933-9

First real-world experience with pulmonary vein isolation using pulsed field ablation for paroxysmal atrial fibrillation

Neven K, Füting A, Höwel D, et al.

Clin Res Cardiol (2021). 10.1007/s00392-021-01933-9

2021

Pulsed Field Ablation For Paroxysmal Atrial Fibrillation Using An Optimized Biphasic Waveform: Recurrence Of Atrial Arrhythmias

Neuzil P, et al.

B-AB06-01, *Heart Rhythm*; May 2021, 18(8), S1-S540 (abstr)

Pulsed Field Ablation Of Left Ventricular Myocardium In A Swine Infarct Model

Sung Il ,et al.

B-AB03-03, *Heart Rhythm*; May 2021, 18(8), S1-S540 (abstr)

How does the Level of Pulmonary Venous Isolation Compare Between Pulsed Field Ablation and Thermal Energy Ablation (Radiofrequency, Cryo or Laser)?

Kawamura I, et al.

AFS 2021-14, *J Cardiovasc Electrophysiol.* 2021; 1-49

Electrolytic Effects from a Clinical Endocardial Pulsed Field Ablation System in a Benchtop Model: a Comparison of Gas Formation with Focal RF Ablation

Woods CE, et al.

AFS 2021-42, *J Cardiovasc Electrophysiol.* 2021; 1-49

Pulsed Field Ablation Using a Multielectrode Pentaspline Catheter: Clinical Outcomes with an Optimized Waveform

Reddy VY, et al.

AFS2021-55, *J Cardiovasc Electrophysiol.* 2021; 1-49

Dielectrophoretic Red Blood Cell Fusion by Pulsed Electric Fields: Ex vivo and Porcine in vivo Experiments

Reddy VY, et al.

AFS2021-56, *J Cardiovasc Electrophysiol.* 2021; 1-49

2020

PFA Preserves Atrial Mechanics After Catheter Ablation For Atrial Fibrillation

Nakatani Y, et al.

D-AB24-01, *Heart Rhythm*; May 2020, 17(5), S1-S622

Esophageal Injury On Cardiac Magnetic Resonance After Catheter Ablation For Atrial Fibrillation: Comparison Between Pulsed Field, Cryoballoon And Radiofrequency Techniques

Cochet H, et al.

D-AB24-06, *Heart Rhythm*; May 2020, 17(5), S1-S622

2020

First-in-Human Experience with Cavotricuspid Isthmus Ablation Using a Focal PFA Catheter

Neuzil P, et al.

D-PO02-125, *Heart Rhythm*; May 2020, 17(5), S1-S622

One Year Clinical Outcomes Following PFA for Paroxysmal AF

Reddy VY, et al.

D-PO01-136, *Heart Rhythm*; May 2020, 17(5), S1-S622

Atrial Wall Changes On Cardiac Magnetic Resonance After PFA For Atrial Fibrillation

Cochet H, et al.

D-PO01-147, *Heart Rhythm*; May 2020, 17(5), S1-S622

Focal PFA For Linear Atrial Lesions-a Preclinical Feasibility Assessment

Kawamura I, et al.

D-PO01-150, *Heart Rhythm*; May 2020, 17(5), S1-S622

Acute Outcomes From The First Use of PFA for PV and Posterior Wall Ablation for Persistent AF

Reddy VY, et al.

D-PO01-170, *Heart Rhythm*; May 2020, 17(5), S1-S622

Best Abstract Award - PFA vs. RF: Esophageal Effects in a Novel Preclinical Model

Koruth J, et al.

AFS-01, *J Cardiovasc Electrophysiol*. 2020; 1-43

Late Breaking Clinical Trials and First Report Investigations - First Report from PersAFOne: PFA to Treat Persistent AF with PVI Plus Posterior Wall Ablation

Reddy VY, et al.

AFS-06, *J Cardiovasc Electrophysiol*. 2020; 1-43

Lesion Durability and Safety Outcomes of PFA in >100 PAF Patients

Reddy VY, et al.

AFS-26, *J Cardiovasc Electrophysiol*. 2020; 1-43

Acute Experience with PFA for Typical Flutter

Anic A, et al.

AFS-33, *J Cardiovasc Electrophysiol*. 2020; 1-43

Lesion Visualization of PFA by MRI in an Expanded Series of PAF Patients

Jais P, et al.

AFS-44, *J Cardiovasc Electrophysiol*. 2020; 1-43

Do PFA Lesions Regress Over Time?

Kawamura I, et al.

AFS-59, *J Cardiovasc Electrophysiol*. 2020; 1-43

2020

AFS2020-39 - Ostial Dimensional Changes After PVI: PFA vs RFA

Kuroki K, et al.

AFS-60, *J Cardiovasc Electrophysiol.* 2020; 1-43

2019

Safety of Pulmonary Vein and SVC Ablation Using Pulsed Electric Field Energy

Vlachos K, Takigawa M, Bourier F, et al.

B-PO03-114, *Heart Rhythm*; 15(5), S330-331 (abstr)

Pulmonary Vein Isolation with Biphasic Pulsed Field Ablation: A Pre-Clinical Comparison with Irrigated Radiofrequency Ablation

Kuroki K, Koruth J, Iwasawa J, et al.

AFS-2019-14, *J Cardiovasc Electrophysiol.* 2019;1-28 (abstr)

Comparison of Biphasic and Monophasic Pulsed Field Ablation in an Animal Model

Jais P, Takigawa M, Sacher F, et al.

AFS2019-26, *J Cardiovasc Electrophysiol.* 2019;1-28 (abstr)

Pulsed Field Ablation for Pulmonary Vein Isolation in Humans: Endoscopic Observations of the Esophagus

Neuzil P, Petru J, Funosaki M, et al.

AFS-2019-27, *J Cardiovasc Electrophysiol.* 2019;1-28 (abstr)

Does Pulsed Field Ablation to Treat Atrial Fibrillation in Humans Cause Pulmonary Vein Stenosis?

Kuroki K, Neuzil P, Petru J, et al.

AFS-2019-30, *J Cardiovasc Electrophysiol.* 2019;1-28 (abstr)

Effect of Pulsed Field Ablation on the Phrenic Nerve During Pulmonary Vein Isolation: Pre-Clinical and Clinical Evaluation

Neuzil P, Petru J, Funosaki M, et al.

AFS-2019-32, *J Cardiovasc Electrophysiol.* 2019;1-28 (abstr)

2018

Acute Results of Superior Vena Cava and Pulmonary Vein Isolation Using Pulsed Electric Field Ablation in a Swine Model

Takigawa M, Vlachos K, Viswanathan R, et al.
B-PO02-004, *Heart Rhythm*; 15(5), S178-179 (abstr)

A catheter-based epicardial pulmonary vein isolation procedure: the Iowa approach

Mickelsen S, Lumpp W, Chaudhary A, Sigurdsson G, Martins J.
PO01-134, *Heart Rhythm*; 13(5), S98-S147 (abstr)

Preclinical safety of novel catheter-based system for intra-pericardial circumnavigation of the left atrium: first steps of the Iowa approach

Mickelsen S, McElderry H, Sauter E, Krothapalli S, Lumpp W, Viswanathan R.
PO03-142, *Heart Rhythm*; 13(5), S251-S339 (abstr)

Posterior left atrial ablation by epicardial electroporation in a porcine model

Kusa S, Koruth J, Enomoto Y, et al.
PO03-143, *Heart Rhythm*; 13(5), S251-S339 (abstr)

Investigation of pulsed electric fields for pulmonary vein and left atrial wall ablation in an acute and chronic porcine model

McElderry H, Walcott G, Koruth J, et al.
AFS-2018-5, *J Cardiovasc Electrophysiol*. 2018;29:657-678. (abstr)

First human experience using pulsed electric fields for AF ablation and isolation of the pulmonary veins and posterior left atrium

McElderry H, Hebler R, Ebner A, et al.
AFS-2018-6, *J Cardiovasc Electrophysiol*. 2018;29:657-678. (abstr)

Safety of pulsed electric field ablation in direct application to the porcine esophagus

McElderry H, Walcott G, Viswanathan R, Long G, Sauter E, Mickelsen S.
AFS-2018-7, *J Cardiovasc Electrophysiol*. 2018;29:657-678. (abstr)

Pulmonary Vein Isolation in Seconds: Pre-clinical Feasibility and Safety Using Pulsed Electric Field Energy in a Porcine Model

Iwasawa J, Koruth J, Kuroki K, et al.
B-PO02-023, *Heart Rhythm*; 15(5), S187 (abstr)

Feasibility of synchronized ultra-short impulse high-voltage direct current technique in left atrial epicardial catheter-based ablation: pericardial atrial fibrillation ablation

Mickelsen S, Long G, Allamargot C, et al.
PO05-104, *Heart Rhythm*; 11(5), S451-492 (abstr)

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