

Cryoballoon Ablation for Atrial Fibrillation with Lead-Free Zero Fluoroscopy Approach Integrating Pulmonary Vein Hemodynamics, Intracardiac Imaging, and 3D Mapping: A Four-Year Single-Center Experience

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BACKGROUND

- Electrophysiologists have for years been plagued with the dangers of prolonged radiation exposure and associated long-term use of lead aprons.
- Patients also are exposed to significant amounts of radiation during fluoroscopy-guided catheter ablations.
- Efforts are being made to pioneer techniques which do not require fluoroscopy without sacrificing efficacy, safety, and patient outcomes.
- Our objective was to evaluate the safety and efficacy of zero-fluoroscopy cryoballoon (ZFC) ablation for atrial fibrillation (AF) with guidance from intracardiac echocardiography (ICE), pulmonary vein (PV) hemodynamics, and 3-dimensional (3D) mapping.

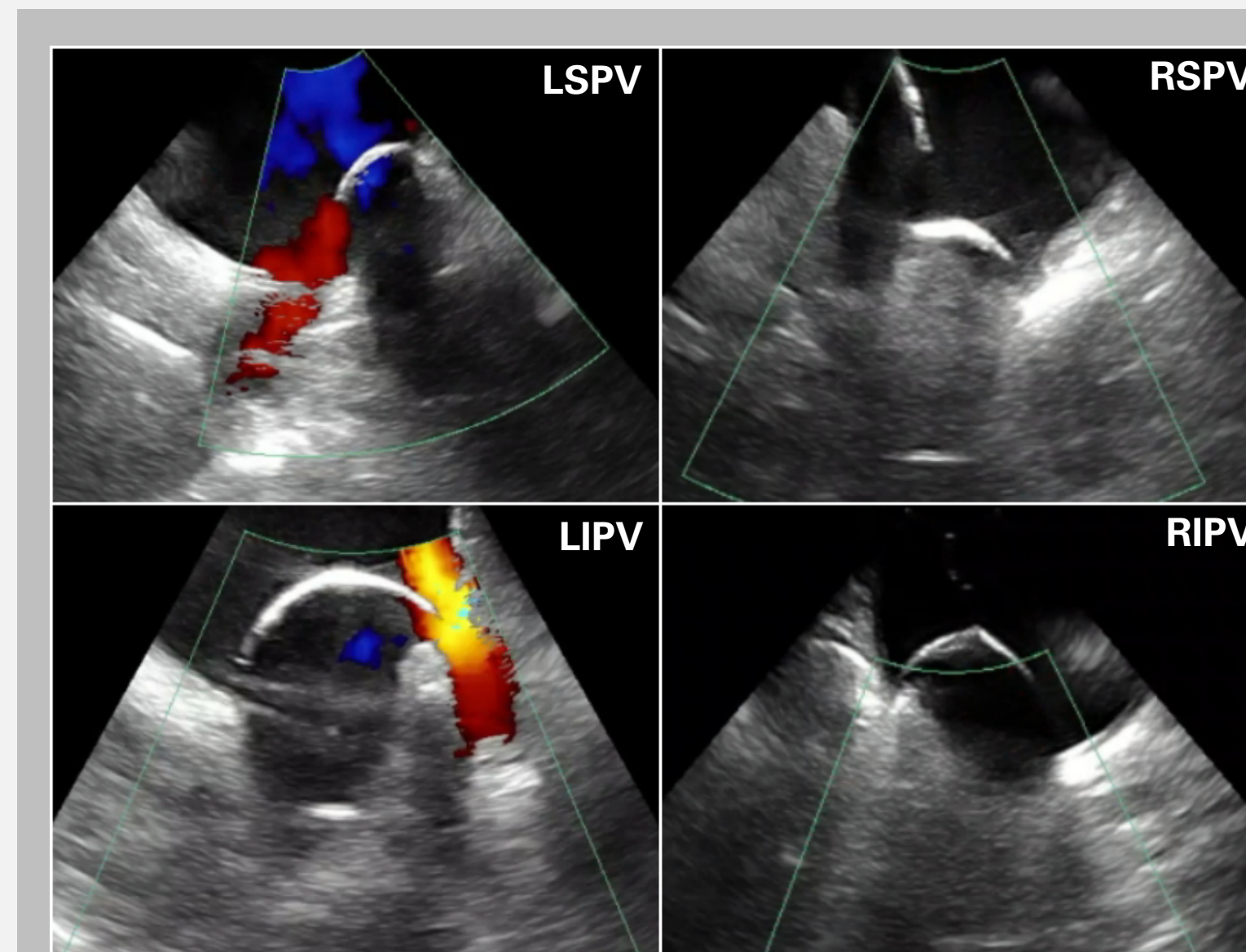
METHODOLOGY

Method: Contiguous patients in a single center underwent zero fluoroscopy cryoballoon ablation for atrial fibrillation with ICE guidance, PV occlusion monitoring using hemodynamics, and 3D mapping.



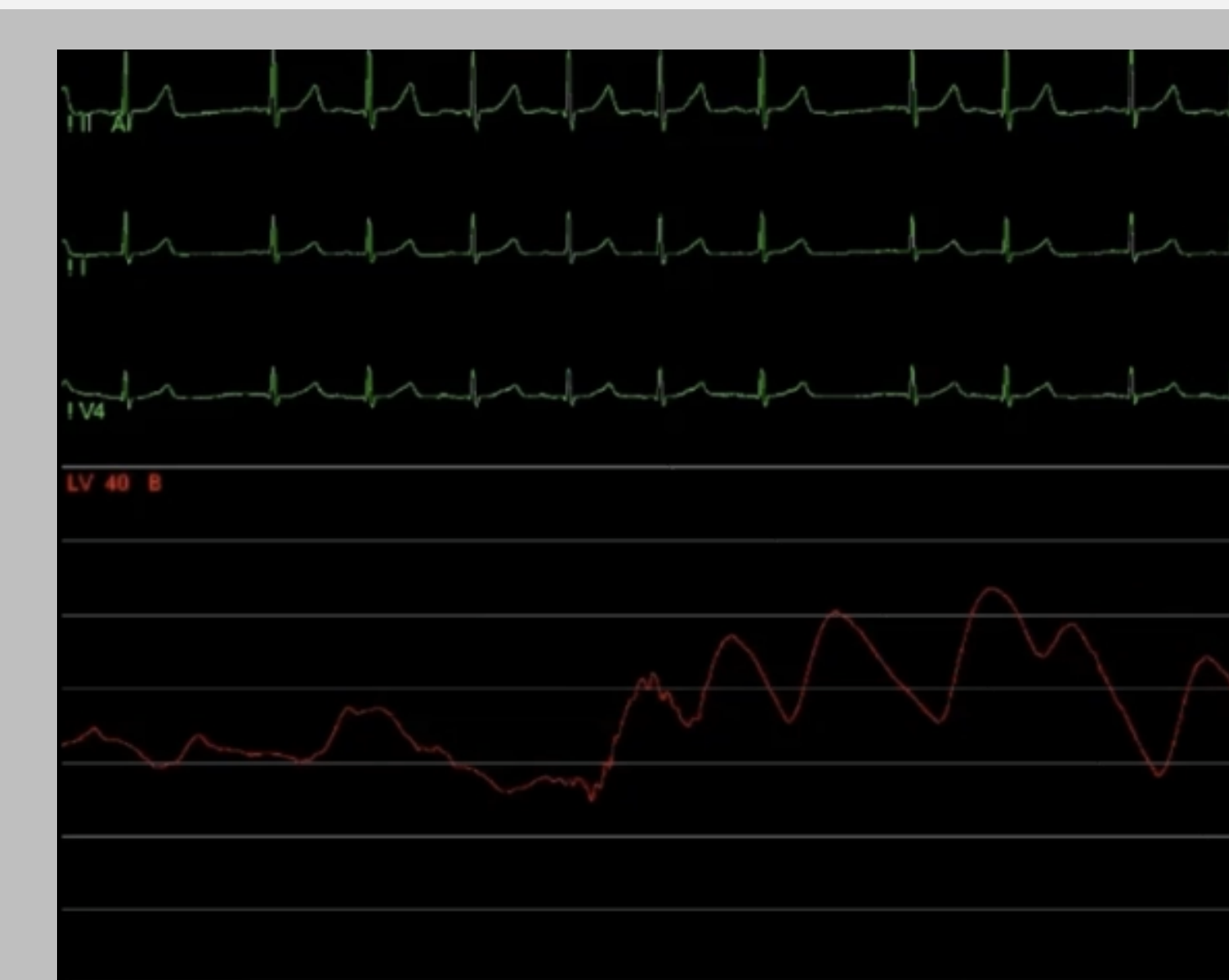
Transseptal Puncture under ICE Guidance

The superior vena cava was visualized with ICE, transseptal puncture was performed and LA sheath placement was confirmed with ICE.

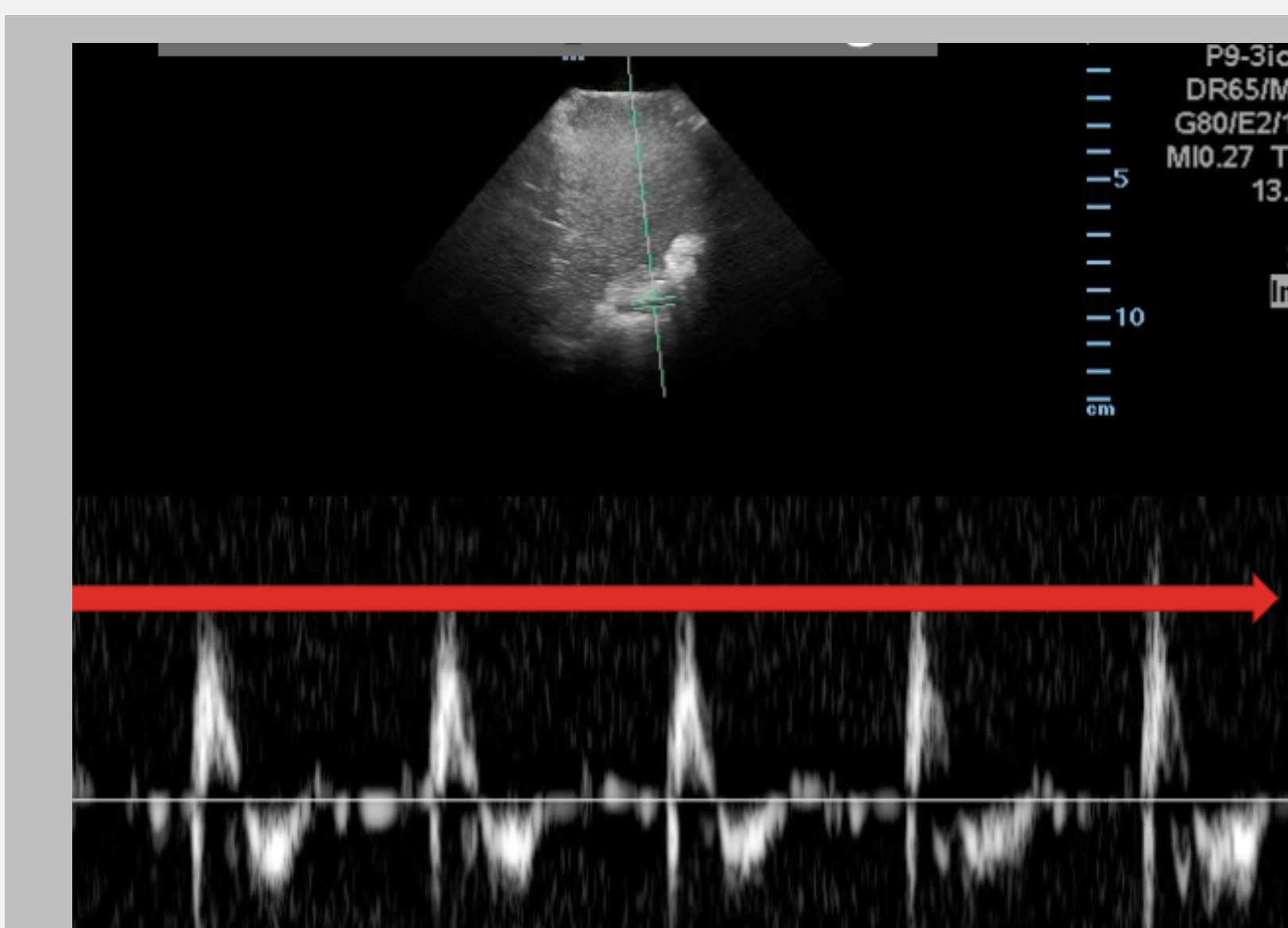


Occlusion of PVs with ICE and Color Flow

ICE catheter was then advanced into the LA through the same transseptal puncture. 3D mapping of the LA was performed, cryoballoon was advanced into the PV antrum, and seal was confirmed with ICE, color-flow doppler, and PV pressure waveform monitoring. Wide antral circumferential ablation was performed along all PVs.

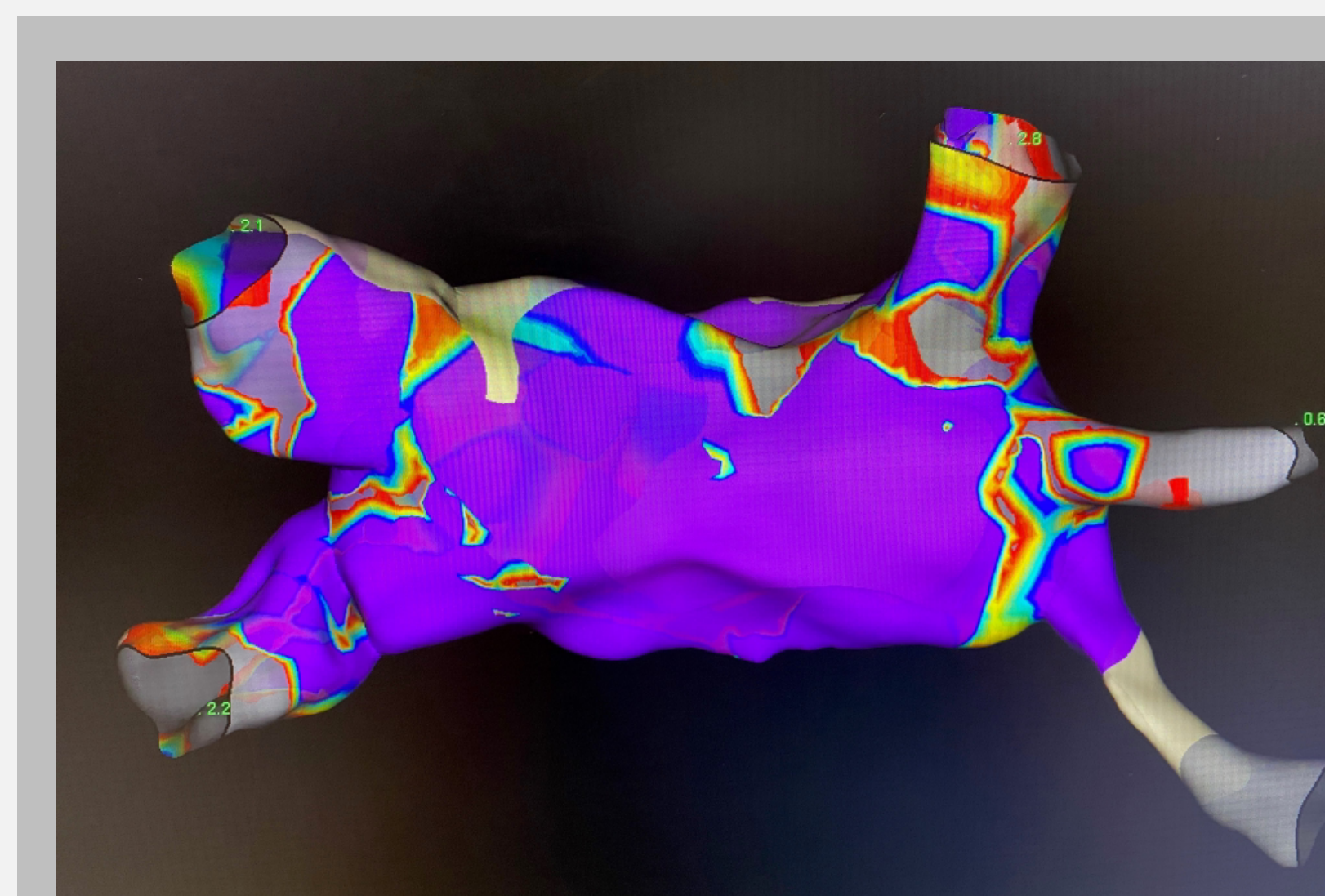


PV Hemodynamics with Occlusion Waveform



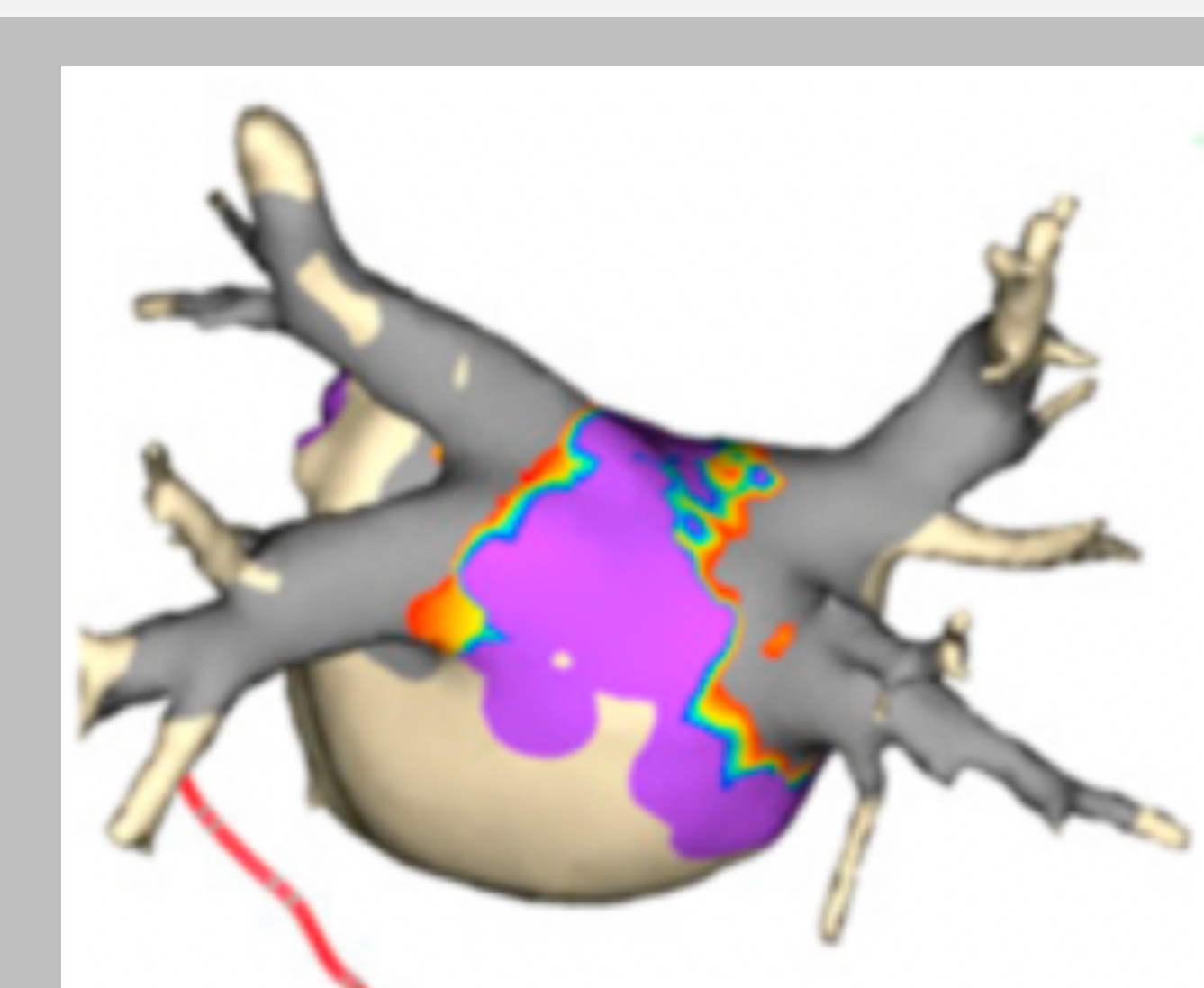
Pulsed Wave Doppler Demonstrating No Phrenic Nerve Injury

During ablation of right PVs, the phrenic nerve was monitored using palpation, liver capsule excursion noted on ICE, and pulsed wave doppler of the liver capsule.



Pre-Ablation 3D Mapping Showing Activation from All PVs

3D mapping was used to ascertain entrance and exit blocks and circumferential antral isolation.



Post-Ablation 3D Mapping Showing Isolation of All PVs

CONCLUSIONS

- Our single center experience demonstrates the feasibility of safely and effectively completing cryoballoon ablations for atrial fibrillation with a lead-free zero fluoroscopy approach.
- Additional multi-center studies are needed to ascertain the wide-scale applicability of this approach.
- The center acknowledges the learning curve associated with this skill set.

FINDINGS

- A retrospective analysis of patients undergoing ZFC for treatment of AF from November 2018 to September 2022 was completed.
- The sample included 433 patients (219 women [50.6%]) with a mean age of 66.5 ± 11.6 years).
- Mean total procedure time was 49.3 ± 12.0 minutes, mean LA dwell time was 36.5 ± 10.3 minutes, and mean duration of cryoballoon application was 15.9 ± 4.0 minutes.
- Procedural complication rates were 0.6% for effusions, 1.3% for phrenic nerve dysfunction, 0.8% for phrenic nerve palsy, 0.1% for vascular complications, 0% for esophageal injury, and 0.5% for all-cause mortality.