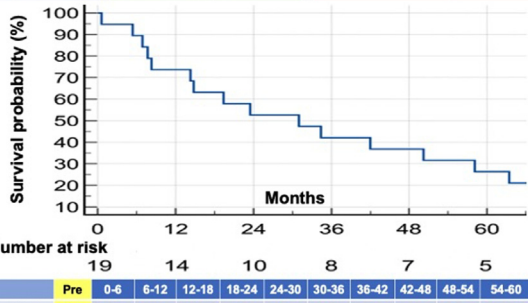
Recurrent VT was common, but ICD shocks were rare: compared to 6 months before treatment, median VT burden and median ICD shocks were significantly reduced in each of the 6-month timeframes. Median ICD shocks per 6-month period decreased from 4 before treatment to 0 for every timeframe after treatment. Freedom from ICD shock was 72% at 1 year. However, freedom from any VT during follow-up was 13%.

15 deaths occurred over 5 years of follow-up. Median survival is 31 months (95% CI, 8.3-58.1). 1-, 2-, and 5-year survival was 74%, 53%, and 25%, respectively. Mode of death was determined to be cardiac-failure (38%) noncardiac (31%), cardiac-arrhythmic (25%), and unknown (6%).

Application: In a very high-risk cohort with refractory VT despite antiarrhythmic medication and catheter ablation, Cardiac Radioablation demonstrated an acceptable safety profile, a substantial reduction in ICD shocks, but rarely VT freedom. Low rates of 5-year survival are likely attributed to underlying comorbidities but may be due to unexplained adverse radiation effects.

Next Steps/Future: The RADIATE-VT multicenter randomized clinical trial will compare the safety & efficacy of noninvasive cardiac radioablation to repeat catheter ablation in high-risk patients with structural heart disease.

DEMOGRAPHIC DATA		TREATMENT DETAILS		RADIATION-RELATED SAE	
Median age, y (range)	66 (49-81)	Median target volume, cc (range)		Pericarditis (prednisone)	80 days
Male sex, n (%)	17 (89%)	Gross target volume (GTV)	25.4 (6.4-88.6)	Pericardial effusion (tap, colchicine)	2.1 years
White Race, n (%)	17 (89%)	Internal target volume (ITV)	31.0 (17.7-128.9)	Gastro-pericardial fistula (surgery)	2.4 years
ICM, n (%)	11 (58%)	Planning target volume (PTV)	98.9 (60.9-298.8)	Mitral regurgitation, Severe (Mitraclip)	3.3 years
NYHA Class 3 or 4, n (%)	16 (84%)				
Median LVEF, % (range)	25 (15-58)	Median beam-on time, min (range)	15.3 (5.4-32.3)		
Prior catheter ablations, n	29 (0-6 per patient)				



	Pre	0-6	6-12	12-18	18-24	24-30	30-36	36-42	42-48	48-54	54-60
VT burden (median)	95	2	4	0	4	0	0	0	0	0	0
VT burden (mean)	102	5	18	4	4	1	0	1	0	0	0
ICD shocks (median)	4	0	0	0	0	0	0	0	0	0	0
ICD shocks (mean)	6.4	2	1	0	0	0	0	0	0	0	0

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NEAR-TERM PREDICTION OF LIFE-THREATENING VENTRICULAR ARRHYTHMIAS USING ARTIFICIAL INTELLIGENCE-ENABLED SINGLE LEAD AMBULATORY ECG

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Introduction: Identifying patients at high-risk of sudden cardiac death (SCD) in the mid to long-term remains particularly challenging. Accurate prediction of lethal ventricular arrhythmias in the near-term would enable preemptive actions to eventually prevent SCD. We hypothesized that artificial intelligence could be leveraged to identify a dynamic electrical profile on Holter ECG data heralding the near-term occurrence of sustained ventricular tachycardia (VT).

Methods: We developed a deep learning-based model using the first 24 hours of extended Holter recordings to predict the risk of sustained (≥30 sec) VT (centrally adjudicated) in the following two weeks. We evaluated the performance of this model on Holter recordings of at least 14 days duration, with no VT in the first 24 hours. The model was evaluated on an internal validation dataset and externally validated on an independent dataset, both of which were not used for model development. Multivariable logistic-regression was performed as a reference model using Premature Ventricular Contraction burden, Heart Rate Variability parameter (SDNN), patient age and sex.

Results: We developed the model using 78,294 unselected Holter recordings collected across the US, UK, France, Czech Republic, South Africa and India. Among 59,302 recordings used for validation (patients mean age 61.3 ± 17.3 years, 40% male), 222 presented sustained VT (mean rate 157 ± 38 bpm, median duration 62 seconds [IQR 42, 173]), with the vast majority (98%) being monomorphic. On the internal validation dataset, the model achieved an AUC of 0.939 with a sensitivity of 83.3% and a specificity of 88.7%. On the external validation dataset, the AUC was 0.911 with a sensitivity and specificity of 78.9% and 81.4%, respectively. The model correctly predicted VT occurrence in 88% of holters with rapid VT (≥180 bpm). The reference model revealed an internal validation AUC of 0.833.

Application: Our findings suggest that a dynamic single-lead ambulatory ECG deep learning-based approach can appropriately identify patients at near-term risk of life-threatening ventricular arrhythmias who could potentially benefit from preemptive interventions to prevent SCD.

Next Steps/Future: The model will be validated in future prospective clinical studies. Near-term prevention through ECG monitoring may additionally be extended to hospital monitoring or wearable sensors with potential applicability to larger populations.