quantify how well a new model reclassifies subjects as compared to an old model.
Results: The ECG-BA had a good correlation with CA (R=0.85, *p* <0.01) in the health population (the mean absolute error: 6.25 ± 0.08 years). The area under the curve (AUC) of CA to predict the onset of aging-related diseases were all higher than 0.73 (CV: 0.82 ± 0.06; non-CV: 0.86 ± 0.07). Compared with the AUC by CA, the combination of ECG-BA and CA increased diagnostic performance for stroke, coronary artery disease, peripheral arterial occlusive disease, myocardial infarction, Alzheimer's disease, osteoarthritis, and cancers, By adding ECG-BA to CA, the percentage of NRI to correct misclassification of CA for the onset of aging-related diseases was 21.0 ± 7.6% (from 9% to 29%). The improvement is best for cancers (29%) (Figure 1).
Conclusion: ECG-BA is a surrogate marker of cardiac aging and improves the risk prediction for the onset of aging-related diseases in addition to the conventional risk factor of CA.

Outcome	NRI 95%CI	P-value
Peripheral arterial occlusion disease	0.27 (0.23 to 0.32)	<.0001
Myocardial infarction	0.24 (0.19 to 0.30)	<.0001
Coronary artery disease	0.15 (0.14 to 0.16)	<.0001
Alzheimer's disease	0.22 (0.15 to 0.29)	<.0001
Osteoarthritis	0.09 (0.08 to 0.11)	<.0001
Cancer	0.29 (0.27 to 0.32)	<.0001

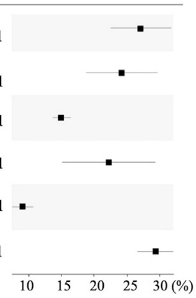

Figure 1. The net reclassification improvement for aging-related diseases after adding ECG-biological age to chronological age.

PO-03-010

BACK TO THE FUTURE: ARTIFICIAL INTELLIGENCE-ENABLED SINGLE-LEAD AMBULATORY ECG CAN UNMASK CONDUCTION TISSUE DISEASE

Laurent FIORINA; Tanner Carbonati; baptiste maille; Kumar Narayanan; Pauline Porquet; Christine Henry; Jagmeet P. Singh; Eloi Marijon and JEAN-CLAUDE DEHARO

Background: Evaluation of patients with syncope remains particularly challenging as life-threatening arrhythmias may be intermittent, and identification of such episodes has major therapeutic and prognostic implications. Routine monitoring during initial evaluation has low yield and often needs repeated, extensive workup, delaying diagnosis and management.
Objective: To evaluate the ability of an artificial intelligence (AI)-enabled single-lead ambulatory electrocardiogram (ECG) to identify patients who previously experienced asystole due to sinus pause or complete heart block.
Methods: The study included 319,396 unselected 14-day ambulatory ECG recordings (mean age 60.5 ± 17.8; 60% female) collected from five Independent Diagnostic Testing Facilities. We developed a deep learning-based model using the last 24 hours of each recording to identify patients with daytime sinus pause of ≥3 seconds, prolonged sinus pause at any time of ≥6 seconds, or complete heart block documented during the previous 13 days of monitoring. Recordings with sinus pause or complete heart block documented during the last 24 hours were excluded from the analysis. The model was evaluated using an internal validation dataset (n=80,767) and externally validated using an independent dataset (n=57,771), both of which were not used for model development.
Results: A total of 4,703 had a daytime sinus pause, 904 recordings had a prolonged sinus pause, 505 had complete heart block, and 5,692 had a composite of any endpoint. On the internal validation dataset, the model identified patients with the aforementioned arrhythmias within the past 13 days with AUCs of 0.91, 0.88, 0.86, and 0.9, respectively (Table 1). On the external validation dataset the model yielded AUCs of 0.88, 0.8, 0.81, and 0.87, respectively.
Conclusion: An AI-enabled single-lead ambulatory ECG may help identify patients with significant intermittent bradyarrhythmia, potentially improving timely diagnosis and management.

	Internal validation			External validation		
	AUC (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)	AUC (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)
Daytime sinus pause ≥3s	0.905 (0.893-0.917)	77.1 (74.5-79.6)	85.5 (85.3-85.8)	0.879 (0.863-0.894)	68.7 (65.3-72.0)	81.0 (80.7-81.4)
Sinus pause ≥6s	0.88 (0.855-0.906)	74.4 (68.2-79.9)	84.5 (84.3-84.8)	0.8 (0.777-0.862)	60.3 (52.4-68.1)	85.8 (75.5-86.1)
Complete heart block	0.856 (0.815-0.895)	81.1 (73.4-88.5)	72.8 (72.5-73.1)	0.805 (0.749-0.872)	70.8 (60.4-81.2)	74.7 (74.4-75.1)
Composite	0.895 (0.884-0.907)	80.4 (78.1-82.7)	80.0 (79.7-80.3)	0.873 (0.857-0.889)	78.5 (75.5-81.5)	81.2 (80.8-81.5)

Table 1. Model performance on the internal and external validation datasets (Composite = a composite of daytime sinus pause ≥3s, sinus pause ≥6s, and complete heart block).

PO-03-011

CLINICAL IMPLEMENTATION OF 3D DEEP LEARNING TECHNIQUES IN PREDICTING TOUCH-UP LESIONS FOR ATRIAL FIBRILLATION PATIENTS UNDERGOING CRYOABLATION

Chih-Min Liu; Wei-Wen Chen; Shih-Lin Chang; Yenn-Jiang Lin; Li-Wei Lo; Yu-Feng Hu; Fa-Po Chung; Tze-Fan Chao; TA-CHUAN TUAN; Jo-Nan Liao; Chin-Yu Lin; Ting-Yung Chang; Ling Kuo; Cheng-I Wu; Shin-Hui Liu; Yang-Che Shiu; Henry Horng-Shing Lu and Shih-Ann Chen

Background: In some atrial fibrillation (AF) cases with cryoballoon ablation (CBA), complete pulmonary vein isolation (PVI) could be particularly challenging, necessitating multiple applications of CBA and additional touch-up radiofrequency ablations due to cardiac anatomical constraints. Identifying patients who may require touch-up lesions prior to CBA is crucial for informed decision-making.
Objective: Our objective was to develop an artificial intelligence (AI) model using 3D deep learning techniques on Pulmonary Vein Computed Tomography (PVCT) images to predict the necessity of touch-up ablation before cryoablation.
Methods: We conducted a retrospective analysis of 190 AF patients who underwent cryoablation (refer to Table 1 for details). For each patient, PVCT images were segmented into geometric slices (each slice measuring 1-5mm, with 46-325 slices per patient, culminating in a total of 39,475 slice images across 190 patients). These images were then processed using both 2D and 3D Convolutional Neural Network (CNN) techniques to predict the AF touch-up lesion model. Various algorithms, including 2D CNN, 3D Point Cloud, and 3D VoxNet, were utilized to construct the AI model.
Results: Employing a range of CNN methods from 2D to 3D, the predictive accuracy for touch-up lesions varied, with Area Under the Curve (AUC) scores ranging from 63.31 to 81.05 (as illustrated in Table 2). The 3D Voxel model (VoxNet) demonstrated superior predictive performance, achieving an AUC score of 81.1%, with an accuracy of 84.6%, recall of 87.1%, precision of 93.1%, and F1 score of 90.0%. The model architecture of 3D Voxel models is depicted in Figure 1.
Conclusion: 3D Voxel AI models, leveraging pre-ablation cardiac CT imaging, prove effective in predicting the need for touch-up lesions in AF patients undergoing cryoablation. Implementing this model could facilitate the identification of patients who need additional tough-up before the procedure.