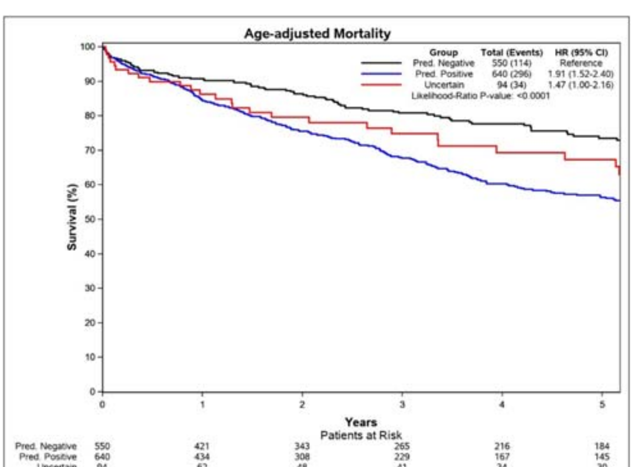
criteria, were scanned using the NovaSignal NovaGuide 2 Automated TCD device. Ground-truthing of collected segments was established using two independent experts who returned a trinary label: Absent (0 MES, 227 segments), Minor (1-15 MES, 110 segments), or Significant (>15 MES, 85 segments). **Results:** For detecting any shunt, the ASGA algorithm had a sensitivity and specificity of 91% and 86%, respectively, as compared to expert graders. When only considering significant shunts the results were 99% and 92%, respectively. **Conclusions:** This study not only demonstrates the efficacy of automated TCD in a clinical setting but also the ability of the ASGA algorithm to correctly capture significant shunts. The proposed combination would allow contrast TCD exams to be performed outside of the current use cases-where it can be performed alongside standard echocardiography. Not only would this provide significant complementary value by identifying a larger number of RLS, but also ease patient burden by allowing diagnostic exams to be performed concurrently.

P4-04 - Oral

Automated Echocardiographic Detection of Heart Failure with Preserved Ejection Fraction using Artificial Intelligence

Ashley P. Akerman[1], Mihaela Porumb[1], Christopher G. Scott[2], Arian Beqiri[1], Agisilaos Chartsias[1], Alexander J. Ryu[2], William Hawkes[1], Geoffrey D. Huntley[2], Ayana Z. Arystan[2], Garvan C. Kane[2], Sorin V. Pislaru[2], Francisco Lopez-Jimenez[2], Rizwan Sarwar[3], Jamie O'Driscoll[4], Paul Leeson[3], Ross Upton[1], Gary Woodward[1], Patricia A. Pellikka[2]. [1]Ultromics Ltd., Oxford, United Kingdom; [2]Mayo Clinic, Rochester, MN; [3]University of Oxford, Oxford, United Kingdom; [4]St George's University Hospitals NHS Foundation Trust, London, United Kingdom

Background: Detection of heart failure with preserved ejection fraction (HFpEF) involves integration of multiple imaging and clinical features which are often discordant or indeterminate. We applied artificial intelligence (AI) to analyze a single apical four-chamber (A4C) transthoracic echocardiogram videoclip to detect HFpEF. **Methods:** A three-dimensional convolutional neural network was developed and trained on echocardiographic apical four-chamber videoclips to classify patients with HFpEF (diagnosis of HF, ejection fraction ≥50%, and echocardiographic evidence of increased filling pressure; cases) versus without HFpEF (ejection fraction ≥50%, no diagnosis of HF, normal filling pressure; controls). Model outputs were classified as HFpEF, no HFpEF, or non-diagnostic (high uncertainty). Performance was assessed in an independent multi-site dataset, compared to the previously validated clinical HFA-PEFF score, and applied to assessment of mortality. **Results:** Training and validation of the AI HFpEF model included 2971 cases and 3785 controls (validation holdout, 16.8% of patients), and demonstrated excellent discrimination (AUROC: 0.97 [95% CI: 0.96-0.97] and 0.95 [0.94-0.96] in training and validation, respectively). In independent testing of 1284 (646 cases, 638 controls), 94 (7.3%) were non-diagnostic, and sensitivity (87.8%; 84.5-90.9%) and specificity (81.9%; 78.2-85.6%) were maintained in clinically relevant subgroups, with high repeatability and reproducibility (kappa 1.0 and 0.621, respectively). The HFA-PEFF score had sensitivity 84.1% and specificity 99.7% but was indeterminate in 820 (63.9%) patients; of these, the AI HFpEF model correctly reclassified 74.4%. During follow-up (median [IQR]: 2.3 [0.5-5.6] years), 444 (34.6%) patients died; age-adjusted mortality was higher in patients classified as HFpEF by AI (hazard ratio [95% CI]: 1.9 [1.5-2.4]) (figure). **Conclusion:** An AI HFpEF model based on a single, routinely acquired echocardiographic video demonstrated excellent discrimination of patients with versus without HFpEF, more often than the HFA-PEFF score, and identified patients with higher mortality.

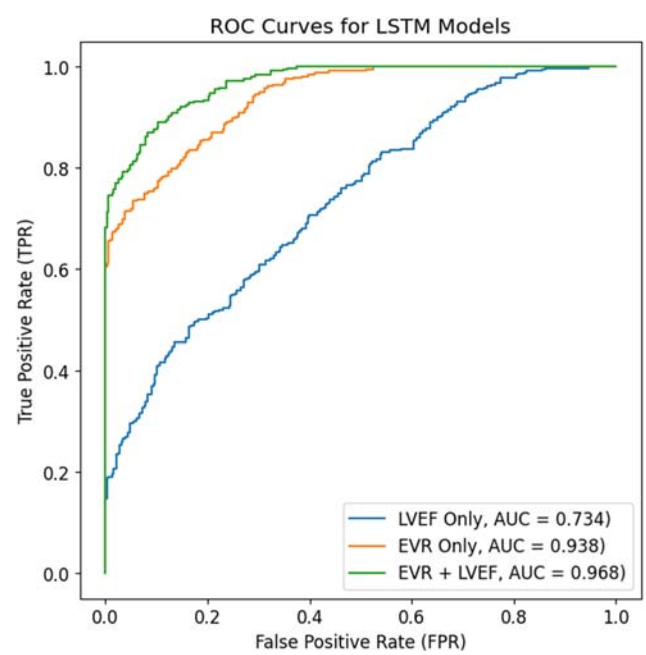


P4-05 - Oral

Enhancement of Left Ventricular Ejection Fraction with Endocardial Viability Ratio Trajectories Using Machine Learning Improves Prediction of Clinical Outcomes in Heart Failure

Josephine Lamp[1], Joseph Dan Khoa Nguyen[1], Joseph Attia[1], Noora Batrash[1], Natalie Skeiky[1], Akua Boadu[1], Garrison Paul Wright[1], Nina Gu[1], Lu Feng[1], Amit R. Patel[1], Nishaki Mehta[2], Khadijah Breathett[3], Younghoon Kwon[4], Cherisse Baldeo[1], Kenneth Bilchick[1], Sula Mazimba[1]. [1]University of Virginia, Charlottesville, VA; [2]William Beaumont Oakland University School of Medicine, Royal Oak, MI; [3]Indiana University School of Medicine, Indianapolis, IN; [4]University of Washington, Seattle, WA

Background: The Endocardial Viability Ratio (EVR), a measure of myocardial oxygen supply-demand balance, may serve as an indicator of cardiac performance at a given workload. The application of EVR with left ventricular ejection fraction (LVEF) trajectories (i.e., serially recorded measurements) in heart failure risk assessment has not been well studied. We hypothesize that EVR and LVEF trajectories are more predictive of adverse outcomes than LVEF trajectories alone. **Methods:** We evaluated a patient cohort with an incident heart failure admission and LVEF of ≤ 50% with serial echocardiograms during 6 years of follow-up. EVR was calculated by dividing the diastolic pressure time index [(diastolic blood pressure – PAWP) x (60 secs/heart rate – 0.2 secs)] by the tension time index [systolic pressure x 0.2 secs] from echocardiographic measurements. PAWP was approximated from echocardiograms using E/E' ratio (PAWP = 1.24 * [E/E'] + 1.9). LSTM models were trained on the trajectories to predict a composite endpoint of death, cardiac transplantation and left ventricular assist device implantation (DeLvTx). Each model was trained for 400 iterations with a 80%-20% split for training/validation. ROC curves and AUC were computed and compared using a bootstrapping approach. **Results:** Among 850 patients (31.4% female, mean age 61.6 +/- 14.6) included in the study, 52% had the DeLvTx outcome. Patients had a median of 5 serial echocardiographic recordings. The median EVR and LVEF was 1.01 and 22.5%, respectively. The use of EVR trajectories (AUC = 0.938, 95% CI = 0.931-0.951) performed better than LVEF trajectories (AUC = 0.734, 95% CI = 0.643-0.731) at predicting DeLvTx across 6 years of follow-up (Figure 1). The use of both EVR and LVEF trajectories performed better than either metric independently, with an AUC of 0.968 (95% CI = 0.957-0.971). The AUC of the EVR model had a statistically significant difference from the LVEF model (p-value < 0.01) and the EVR + LVEF model (p-value < 0.01). **Conclusion:** Unfavorable EVR trajectories, independently or with LVEF trajectories, were associated with a higher incidence of the DeLvTx outcome in patients with heart failure. The use of EVR and LVEF trajectories could enhance risk assessment in heart failure.



P4-06

Novel Approach to Regional Circumferential Strain Analysis: Bringing Cardiac Magnetic Resonance Precision to Echocardiography Using a New Artificial Intelligence Model

Yu Wang[1], Cristiane C. Singulane[2], Shuo Wang[2], Changyu Sun[3,1], Derek J. Bivona[2], Kenneth C. Bilchick[2], Amit R. Patel[2], Frederick H. Epstein[1]. [1]University of Virginia, Charlottesville, VA; [2]University of Virginia Health System, Charlottesville, VA; [3]University of Missouri, Columbia, MO

Background: StrainNet is a recently-developed deep learning model trained using Displacement ENcoding with Stimulated Echoes (DENSE) Cardiac Magnetic Resonance (CMR) images to predict intramyocardial displacement from myocardial contours (Fig. 1A). StrainNet can be applied to any image series that provides myocardial contours, including echocardiographic images. We hypothesize that StrainNet would provide more accurate circumferential strain (E_{cc}) analysis of echo images than speckle tracking (STE) and provide more interchangeable strain values between echo and CMR. **Methods:**