



Spotlight on Special Topics

DEEP LEARNING-BASED PREDICTION OF RIGHT VENTRICULAR EJECTION FRACTION USING 2D ECHOCARDIOGRAMS

Poster Contributions

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Background: Conventional echocardiographic metrics of right ventricular (RV) function have several shortcomings, which can be overcome by 3D echocardiography (3DE)-derived RV ejection fraction (RVEF). However, the availability of 3DE might be limited. Accordingly, we implemented a deep learning (DL)-based tool to estimate 3D RVEF using 2D echocardiograms.

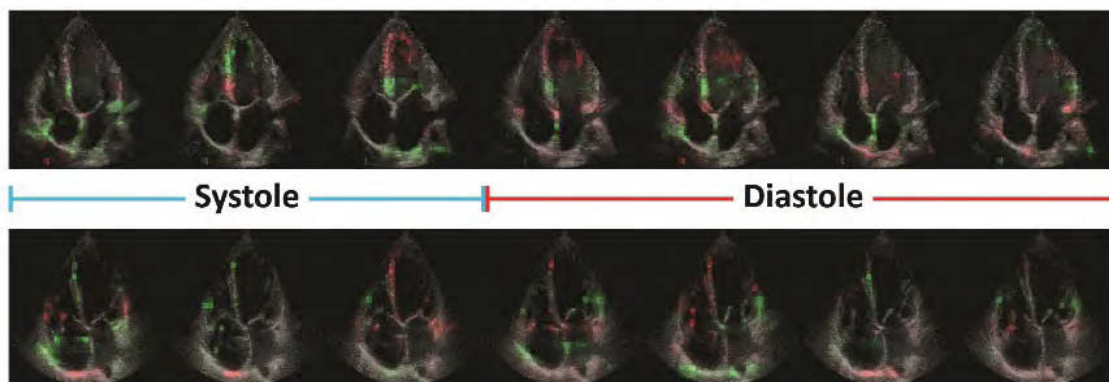
Methods: We retrospectively identified 859 subjects (e.g., healthy controls, patients with heart failure or valvular heart disease) with 3DE datasets suitable for 3D RVEF assessment. RV dysfunction was defined as 3D RVEF <45%. For each patient, apical 4-chamber view 2D echocardiograms were exported, and patients were randomly assigned to training or test cohorts (80:20 ratio). Then, we implemented a spatiotemporal neural network consisting of two key components: a feature extractor that processes the unique features of each frame and a temporal convolutional layer that combines this information to evaluate temporal changes and predict 3D RVEF.

Results: The final dataset comprised 4,248 2D echocardiograms. Our DL model predicted RV dysfunction with an accuracy of 81.2% (sensitivity: 78.6%, specificity: 81.9%, F1 score: 0.642). Using 2D echocardiograms of two representative patients (see figure), we also visualized the areas of a given frame that improved (green) or hampered (red) the accuracy of the prediction.

Conclusion: Our DL-based tool could identify RV dysfunction (assessed by 3D RVEF) from 2D echocardiograms with high accuracy.

Patient #1

3D RVEF (ground truth): **60.8%** - Prediction: **Normal RV function**



Patient #2

3D RVEF (ground truth): **34.4%** - Prediction: **RV dysfunction**