Letters

TO THE EDITOR

Can Deep Learning Improve 2D Echocardiographic RV Assessment? First Important Steps

We read with great interest the study by Tokodi et al[1] on deep learning (DL)based prediction of right ventricular ejection fraction (RVEF) with the use of 2D echocardiography. First, the authors are to be praised for their initiative, because DL may prove helpful in bridging the gap between 3D imaging and 2D echocardiography. Second, the authors admittedly performed a thorough work using a large data set that is typically required for DL methodologies, and they proposed a fully automated method. However, we have some important comments that could help readers to better interpret this work, as well as the authors to further improve it.

Tokodi et al[1] suggest that their method achieved great accuracy, matching that of 3D imaging. The mean absolute error for predicting RVEF is indeed very low, but the evaluation of prediction models cannot rely on a single statistical type of error. The proposed method has an R^2 of 0.45 , which means that the fraction of RVEF variance that is not explained by this prediction is 55%. For comparison, the R^2 for 2D echocardiographic fractional area change has been reported as 0.76.[2] In addition, the sensitivity of the authors' method for detecting RVEF < 45% is 0.727 , which means that more than 25% of patients with RV dysfunction would be missed. Finally, Tokodi et al[1] report a higher sensitivity of their method compared with an expert cardiologist. However, the latter evaluation was based on visual inspection only, without use of any quantitative indices.

Therefore, we interpret the performance of the proposed DL method as being closer to that of simple 2D visual assessment of the RV. A main reason for these results is the use of a single right ventricular (RV) view to predict RVEF, a limitation that is not discussed by the authors. Owing to the complex RV shape, global RV function cannot be more accurately evaluated from a 4-chamber view, regardless of whether a DL methodology is used. Simply put, only a portion of the RV is seen. A more tedious but accurate approach would be to start by using multiple 2D RV views that allow better assessment of the 3D RV shape. [3] Even for left ventricular ejection fraction assessment by Simpson's rule, 2 views are used.

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The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

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