学 位 論 文 の 要 旨

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主論文の題名

Prediction of Pulmonary to Systemic Flow Ratio in Patients With Congenital Heart Disease Using Deep Learning–Based Analysis of Chest Radiographs

主論文の要旨

Chest X-ray is a useful noninvasive modality in daily practice to evaluate pulmonary blood flow status in patients with congenital heart disease. However, its predictive value is limited by the subjective and qualitive nature of the interpretation. In this study, we tested a hypothesis that deep learning-based analysis of chest X-ray predicts pulmonary to systemic flow ratio, which is an important hemodynamic parameter for clinical decision-making in patients with congenital heart disease, quantitatively.

This retrospective observational study included 1031 cardiac catheterizations performed for 657 patients at a tertiary center. Seventy-eight patients (100 catheterizations) were randomly assigned for evaluation. A deep learning model that predicts the pulmonary to systemic flow ratio from chest radiographs was developed using the method of transfer learning.

As a result, the pulmonary to systemic flow ratio predicted by our deep learning model was significantly correlated with the values calculated using the Fick formula (interclass correlation coefficient, 0.68). The diagnostic concordance rate of our model was significantly higher than that of experts (64/100 vs 49/100 cases, P=.02 [McNemar test]).

The present results may confer an opportunity to quantify otherwise qualitative and subjective findings of pulmonary vascularity in the clinical setting.