

AI accuracy in detecting atrioventricular concordance and discordance: enhancing diagnosis of corrected transposition of the great arteries



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Introduction

As congenital heart defects are among the most common birth defects, there is a critical need for tools that can enhance the accuracy and accessibility of their detection. Many AI systems have been developed to localize anatomical structures on ultrasound images but are rarely tested on abnormal data due to its scarcity, despite the potential of these tests to reveal AI biases.

Objectives

This study evaluates two AI models' (not yet approved) ability to determine correct atrioventricular (AV) connections (morphological left atrium to left ventricle, right atrium to right ventricle) on fetal 4-chamber (4CH) views in both normal fetuses and those with congenitally corrected transposition of the great arteries (ccTGA).

Methods

This study evaluated two AI models for identifying AV concordance and discordance on 4ch views. AI-1 was trained on thousands of normal 4CH images without any ccTGA case. AI-2 was trained using the same images plus 136 images of AV discordance from 11 patients with ccTGA. 20 ccTGA images were exclusively reserved for testing of AI-2. AI-1 was tested on the 156 AV discordance images. Both AI models were also assessed on their ability to recognize AV concordance.

Conclusion

AI1 demonstrated strong performance in recognizing normal AV concordance but was showing a significant bias when tested on AV discordance. This bias, likely due to over-reliance on positional context rather than morphological features, was effectively corrected in AI2 by including a limited number of annotated pathological examples in training.

Results on test set

AI-1

Tested on 156 AV discordance and 262 AV concordance images

18.6%
sensitivity

95.8%
specificity

+66.4%
sensitivity by adding
11 pathological cases
in training set



AI-2

Tested on 20 AV discordance and 353 AV concordance images

85%
sensitivity

96.3%
specificity

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