Case Reports and Reviews

Short Communication



Artificial Intelligence for Early Detection of Coronary Artery Changes in Kawasaki Disease in Comparison with Conventional Echocardiographic Measurement

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Abstract

Kawasaki disease (KD) is an acute childhood vasculitis in which coronary artery abnormalities are the most important cardiovascular complication that may result in death.

Early identification of coronary artery changes is essential because coronary dilatation and aneurysm formation may evolve rapidly during the acute and subacute phases of the disease. This is the critical period in which diagnosis is a challenge as many cases can be managed early with good outcome.

Transthoracic echocardiography is the primary cardiac imaging modality for KD because it is non-invasive and provides high spatial and temporal resolution. Coronary artery dimensions are normalized for body surface area and expressed as Z-scores to improve assessment across different ages and body sizes [1].

However, conventional manual measurement has limitations. Coronary arteries in young children are very small and individually dependent. The differences in measurement can produce changes in Z-score. Different Z-score equations can also affect the diagnosis and management of coronary artery [1–3].

Artificial intelligence (AI) allows measuring coronary dimensions, analyzing coronary morphology and brightness. Deep-learning studies have demonstrated the feasibility of detecting coronary lesions from pediatric cardiac ultrasound images. While recent machine-learning research has quantified coronary artery brightness in associations with coronary dimensions and Z-scores [4,5].

Introduction

Kawasaki disease (KD) is a systemic inflammatory vasculitis that primarily affects children. Coronary artery involvement is the major cardiovascular complication and can result in coronary artery changes. These changes include coronary dilatation and aneurysm formation. The most important and critically diagnosis is coronary thrombosis that result in myocardial ischemia and death [1].

The 2024 American Heart Association (AHA) scientific statement identifies echocardiography as the primary imaging modality in acute KD. The proximal LAD and RCA are particularly important because these are common sites of coronary abnormalities [1]. However, the early changes in the coronary artery as coronary brightness can be seen by the AI. This is the early step in the process of coronary dilation and anyresm formation. These early changes cant not be seen by the echocardiography.

The advantages of AI system could provide early and follow up parameters regarding coronary diameter, Z-score, coronary brightness and morphology.

Together, these may provide a more sensitive representation of coronary evolution than a single manual diameter measurement as happened by electrocardiography.

The most appropriate clinical model is likely in the following process: AI detection, AI measurement, AI trend analysis and expert pediatric cardiologist confirmation. Therefore, AI-assisted echocardiography has the potential to improve early detection of coronary artery changes in KD.

Discussion

Early coronary arteries changes detection are the most important targets for improving KD management. The 2024 AHA statement emphasizes early diagnosis and recognizes coronary Z-score abnormalities is an important marker of risk [1].

The main advantage of AI may be the ability to transform serial echocardiograms into quantitative longitudinal data. This allows

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comparison between the changes of normal study that seen today and abnormal study later. AI could potentially identify a small but progressive change over time. This distinction is important because coronary abnormalities can evolve during the acute and subacute stages of KD.

AI may provide three complementary measurements as not one parameter is used. First, coronary artery diameter and Z-score. Second, the coronary artery brightness and morphology. Third, the time and rate of changes across serial examinations. However, there are many limitations as large and diverse datasets. The external validation and standardized image acquisition are needed. consistent Z-score methodology. Different Z-score formulas can produce different classifications, making standardization essential [3].

Artificial intelligence for early coronary artery evaluation

AI could potentially improve the conventional workflow by analyzing echocardiographic images automatically. The cascade process for AI is echocardiographic cine loop quantification then improving the image-quality. The next step is automatic identification if there is coronary dilation then localization of affected artery.

Three arteries are important for evaluation: left main coronary artery (LMCA), left anterior descending coronary artery (LAD) and right coronary artery (RCA).

Another important step is Z-score calculation. This is done by coronary artery segmentation and automatic diameter measurement. An important step for clear diagnosis is coronary artery brightness and serial comparison by the previous serial images. This helps in early-change alert is done for suspected case with early coronary changes. Pediatric cardiologist confirmation is important as this is a quantitative assistant rather than replacing the clinician role in diagnosis and management.

One study developed a Scaled-YOLOv4-HarDNet model to detect coronary lesions and coronary brightness from echocardiography. The model achieved a mean average precision of 72.63%, demonstrating the feasibility of automated coronary image detection [4].

An important feature of this study is that the investigators specifically addressed the difficulty of detecting coronary abnormalities in infants and young children. This is because the coronary arteries are extremely small and echocardiography images may contain substantial background noise that limit the diagnosis [4]. This supports the concept that AI could be useful for detecting subtle coronary abnormalities that are challenging to recognize.

Another important thing is AI analysis of the coronary brightness. An investigational imaging biomarker is developed that not depend on the brightness alone but three added parameters are evaluated to complete the diagnosis. These include larger coronary artery diameters, a higher proportion of patients with maximum coronary Z-score ≥2.5 and higher levels of selected inflammatory biomarkers [5].

Masui et al. studied 89 children with acute KD and extracted pixel values from the LMCA, LAD and RCA. The investigators standardized coronary brightness measurements and used machine learning to identify patient clusters [5].

The KCPREDICT study developed a machine-learning model using 24 clinical and laboratory features from 1,474 children with KD. The best-performing decision-tree model achieved an AUROC of 96.0% in the reported dataset [6].

A 2024 systematic review and meta-analysis included nine studies evaluating machine learning for early prediction of coronary artery lesions in KD. Across those studies, the pooled validation concordance index was 0.787, indicating promising but not definitive predictive performance [7-10].

Importantly, prediction models should complement—not replace—serial echocardiography.

Conventional Echocardiographic Assessment

Echocardiography remains the standard method for evaluating coronary arteries in acute KD [1]. The principal measurements include: Left main coronary artery (LMCA), Left anterior descending artery (LAD), Right coronary artery (RCA) and Left circumflex artery when adequately visualized. The coronary lumen is measured and normalized according to body surface area.

There are four limitations for validity of coronary arteries assessment:

1. Operator variability as different operators may place calipers slightly differently
2. Image quality as Motion, acoustic windows and ultrasound artifacts may make the coronary borders difficult to define.
3. Very small coronary arteries as in infants and young children. A difference of a fraction of a millimeter can affect the calculated Z-score.
4. Variability of Z-score has different mathematical models can produce different Z-scores from the same coronary measurement.

A study involving 1,509 children with KD compared six Z-score equations and demonstrated differences in the classification of coronary artery dilatation [3].

In the future AI systems could detect small diameter changes, coronary brightness, morphological changes and progressive change over serial examinations.

AI help in adjunct to conventional echocardiography and prospective multicenter validation.

References

1. Jone PN, Tremoulet A, Choueiter N, et al. Update on Diagnosis and Management of Kawasaki Disease: A Scientific Statement From the American Heart Association. Circulation. 2024;150:e481-e500. doi:10.1161/CIR.0000000000001295.
2. McCrindle BW, Rowley AH, Newburger JW, et al. Diagnosis, Treatment, and Long-Term Management of Kawasaki Disease: A Scientific Statement for Health Professionals From the American Heart Association. Circulation. 2017;135:e927-e999. doi:10.1161/CIR.0000000000000484.
3. Si X, Hou C, Wang H, et al. Comparison of six Z-score formulas based on echocardiography for coronary artery lesions in Kawasaki disease. International Journal of Cardiology. 2024;409:132102. doi:10.1016/j.ijcard.2024.132102.
4. Detection of coronary lesions in Kawasaki disease by Scaled-YOLOv4 with HarDNet backbone. PubMed-indexed study of deep-learning detection of coronary lesions and coronary brightness on cardiac ultrasound images.
5. Masui D, Iwashima S, Miyagi Y, et al. Coronary Artery Brightness on Echocardiography as a Novel Marker in Kawasaki Disease—Machine Learning-Based Cluster Analysis. Circulation Reports. 2026;8(2):306-315. doi:10.1253/circrep.CR-25-0247.

6. Development and Validation of KCPREDICT: A Deep Learning Model for Early Detection of Coronary Artery Lesions in Kawasaki Disease Patients. 2025. PubMed PMID: 39825907.
7. Zhu J, Yang F, Wang Y, et al. Accuracy of Machine Learning in Discriminating Kawasaki Disease and Other Febrile Illnesses: Systematic Review and Meta-Analysis. Journal of Medical Internet Research. 2024.
8. Predicting coronary artery abnormalities in Kawasaki disease: Model development and validation. Multicenter prospective development and external-validation study. 2026. PubMed PMID: 41949774.
9. Assessment of coronary artery abnormalities and variability of Z-score calculation in the acute episode of Kawasaki disease. European Journal of Clinical Investigation. 2020;50:e13409. doi:10.1111/eci.13409.
10. Differences in Sensitivity Between the Japanese and Z Score Criteria for Detecting Coronary Artery Abnormalities Resulting from Kawasaki Disease. Pediatric Cardiology. 2022. doi:10.1007/s00246-022-03008-6.