

Physical and 3D virtual models of congenital heart diseases for medical education

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Objectives

Congenital heart disease is a major cause of neonatal morbidity and mortality. Conventional two-dimensional (2D) fetal echocardiography may limit spatial understanding of complex anatomy. This study will assess whether immersive three-dimensional (3D) reconstructions improve neonatologists' understanding compared with 2D images.

Results

Immersive 3D visualization is expected to improve spatial perception, diagnostic confidence, engagement and knowledge retention compared with conventional 2D images.

Methods

Representative examinations performed at 18 – 28 weeks will be segmented in 3D Slicer, refined in Blender and exported to a metaverse platform for virtual-reality visualization. Neonatologists will attend workshops and complete questionnaires before, immediately after and one week later. Scores will assess baseline knowledge, learning and retention.

Conclusion

Metaverse-based 3D fetal cardiac visualization may improve understanding of complex congenital heart disease. If confirmed, this approach may contribute to medical education.

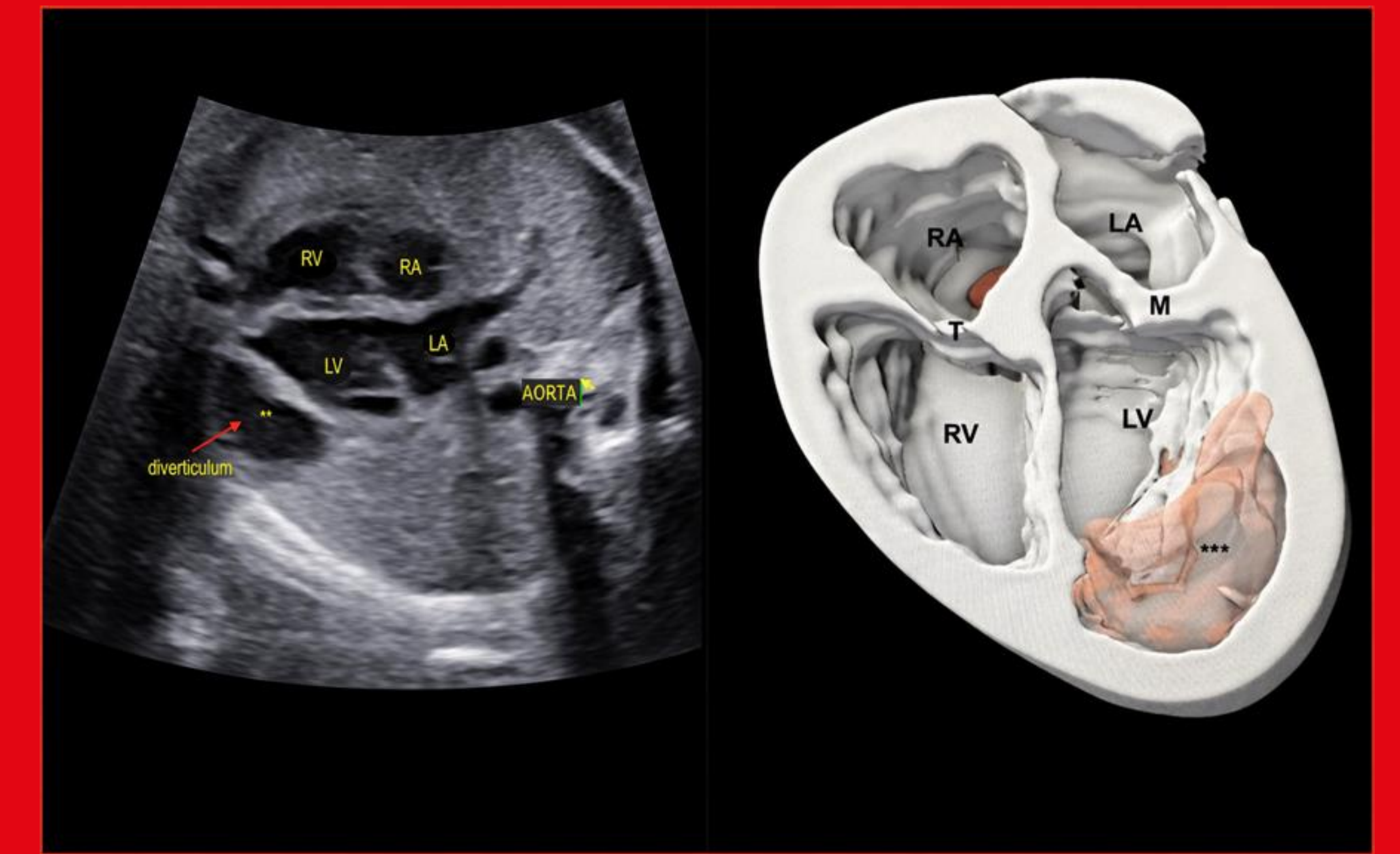


Figure 1. Conceptual comparison of 2D echocardiography and 3D reconstruction.



Figure 2. Immersive visualization of a 3D fetal heart model.

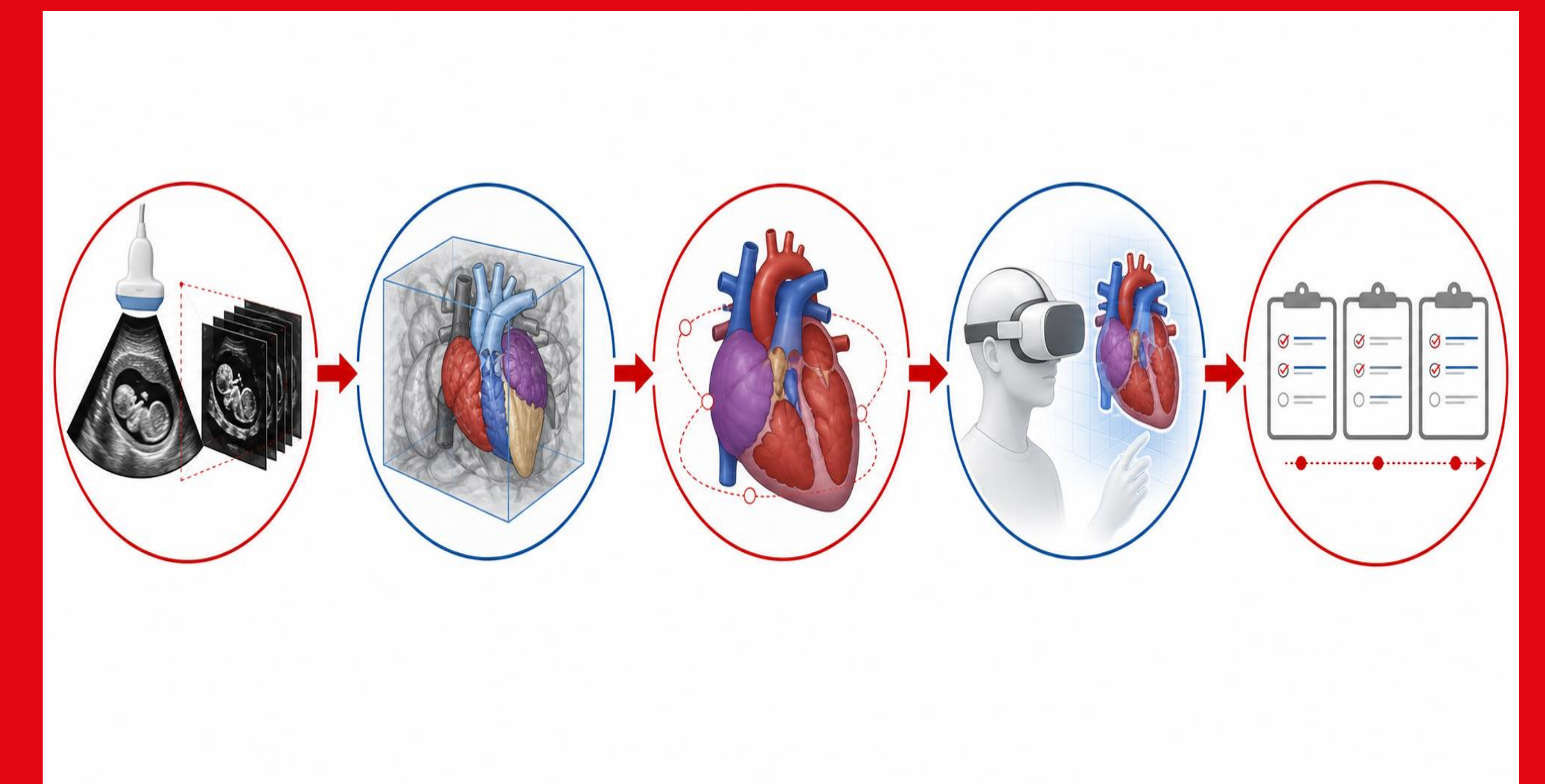


Figure 3. Proposed study workflow.