

**Use of 3D printing in the evaluation of complex Congenital Heart Disease (CHD). 4 Cases.**

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**Introduction and Objectives:** The practice of modern medicine in many medical subspecialties relies on advanced imaging. Ultrasonography, Computerized Tomography and Magnetic Resonance Imaging can produce 3D images aiming to provide physicians with improved appreciation of the anatomy. Three dimensional printing (3D printing) is a new tool poised to help surgeons appreciate complex cardiac anatomic features and their interrelationships with surrounding tissues. We sought to explore the utility of creating anatomically accurate 3D printing models for patients with complex or unusual congenital heart defects in facilitating diagnostic understanding and surgical planning.

**Methods:** Based on contrast-enhanced computer tomography (CT) or magnetic resonance (MRI) images, after appropriate segmentation and processing, accurate 3D printed models of the relevant cardiac anatomy (including appropriately planned sections) were created. These were utilized for the entire surgical team to appreciate the anatomy, for patient family education, and for optimizing surgical planning, including surgical simulation. We present 4 cases, two patients with anomalous aortic origin of coronary artery (AAOCA), and two with double outlet right ventricle (DORV) and TGA, (one with restrictive VSD and the other with complete atrio-ventricular septal defect).

**Results:** The models proved helpful for diagnostic appreciation of the anatomy, family education, surgical decision making, preoperative planning and surgical simulation.

**Conclusion:** Printing of 3D cardiac models is a new and much promising tool for the diagnostic assessment and preoperative preparations for patients with complex or unusual congenital heart defects. The opportunity to handle accurate models of the anatomy in ways impossible even at operation enables the care team to appreciate potential procedural difficulties, avoid surprises during operation, and clarify aims and limitations of planned surgical interventions. This new technology can enrich patients', students', and physicians' understanding of structural heart disease with the ultimate result of enhancing the level of care provided to this growing subset of patients.