**MP4-6**

**3D Printed models for Interventional Planning - Assessment in patients with Coronary Fistula**

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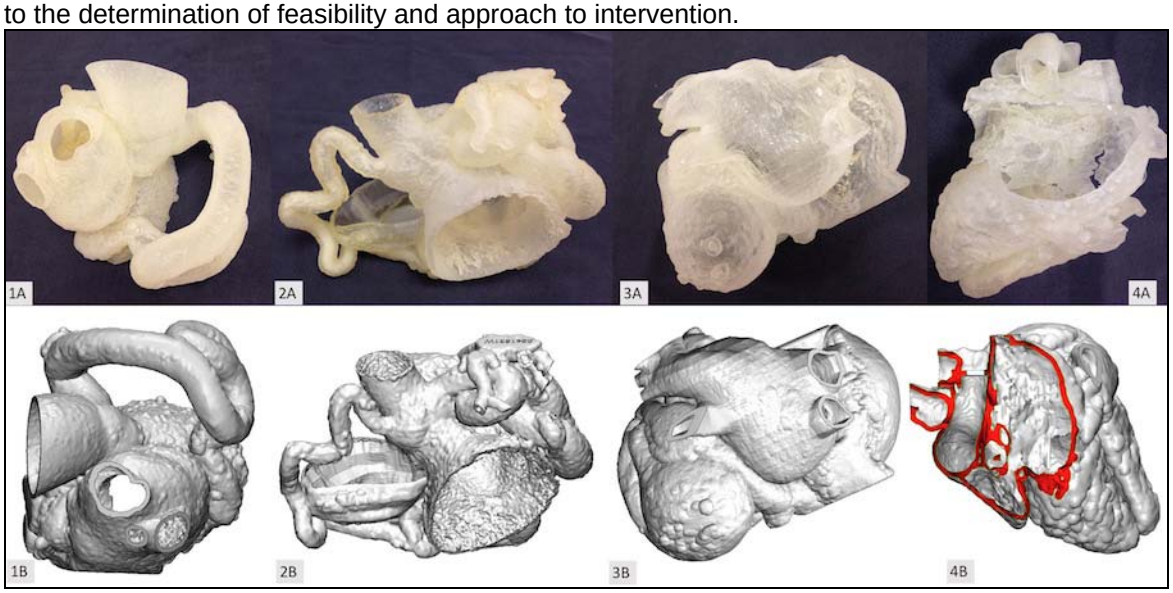
**Introduction:** Coronary fistulae represent one of the most challenging anatomical defects to define accurately. We investigate the added benefit of three dimensional (3d) volume rendering (VR) of cross-sectional images over 3d printing for diagnosis and interventional planning.
**Methods:** Four cases of coronary fistula were considered for trans-catheter closure. Multidetector computed tomography (MDCT) with retrospective gating (3 cases) or MRI (3d whole-heart balanced steady-state-free-precession) images were used. Segmentation was performed using Mimics v18.0, Materialise, Leuven, Belgium. Printed models used polyjet technology (Tango plus material) or fused deposition modelling (polyurethane).
Two cardiologists, independently reported source images. They were then given access to 3D VR and allowed to review source images and revise the report. The case was then discussed with the interventional team to plan device closure. Finally, the team was given access to the printed model and allowed to review all images and reconsider the plan.
**Results:** Case 1 had an RCA (right coronary artery) to LV (left ventricle) fistula. Case 2 had a fistula to the CS (coronary sinus) communicating with RCA and LCx (left circumflex). Case 3 had a LCx artery fistula draining to both the CS and LAA (left atrial appendage) with two aneurysms. Case 4 had a fistula from the left main stem (LM) to the SVC–RA junction.
Using source images alone, both cardiologists were able to correctly describe the course and drainage of 2/4 cases. The use of volume rendering increased this to 4/4 for both cardiologists. However, the interventional plan made after review of source imaging and VR, was changed for two cases after reviewing the 3d printed models alongside conventional images. In case 3, the initial approach and device sizing was changed and in case 2, the decision to proceed was changed after the extent of bilateral coronary involvement was fully appreciated.
**Conclusions:** Coronary artery fistulae require detailed 3D geometric analysis using VR in addition to MDCT or MRI source images for correct diagnosis. In these cases, 3D printing adds incremental value to the determination of feasibility and approach to intervention.




*1) RCA to LV fistula. 2) Coronary fistula to CS involving the RCA and LCx. 3) Left circumflex fistula draining to CS and LAA (with 2 aneurysm). 4) Fistula from left main stem to SVC-RA junction.*
*A) 3D printed model on Tango Plus. B) 3D Mesh performed on Mimics.*
*RCA= right coronary artery. LV= left ventricle. CS= coronary sinus. LCx= left circumflex.*
*LAA= left atrial appendage. SVC= superior vena cava. RA= right atrium*