

3D-printed heart models

in pediatric cardiology and heart surgery
to optimize training and patient care





Carina Hopfner

Biomedical Engineer, M. Sc.

LMU Klinikum

Department for Pediatric Cardiology and Intensive Care

Campus Großhadern | Marchioninstr. 15 | 81377 Munich
tel. 089 4400-76942 | fax 089 4400-73943

carina.hopfner@med.uni-muenchen.de | www.lmu-klinikum.de |
3D Printing in Pediatric Cardiology

Agenda

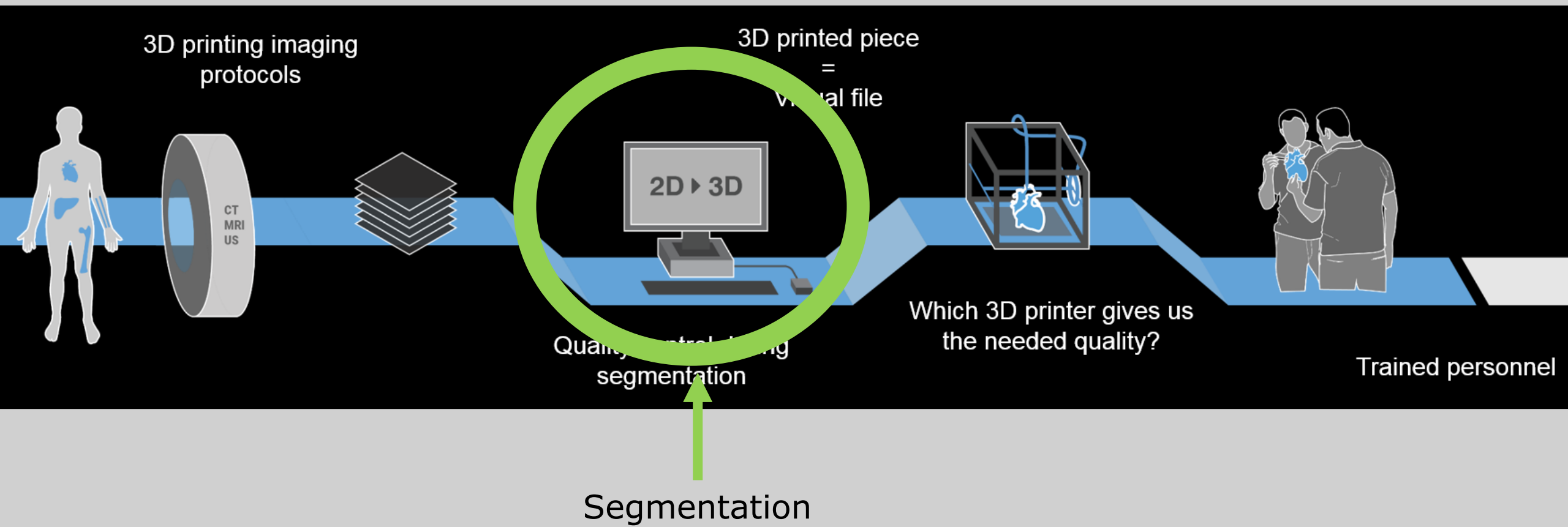
1. How we create our 3D models
 1. Segmentation
 2. Design
 3. 3D Printing

2. Applications of 3D Printed Models in Pediatric Cardiology and Cardiac Surgery
 1. Research: Device Testing
 2. Training: Hands-on Catheterization Training
 3. Patient Care: Surgical Planning

3. Why 3D Printing?

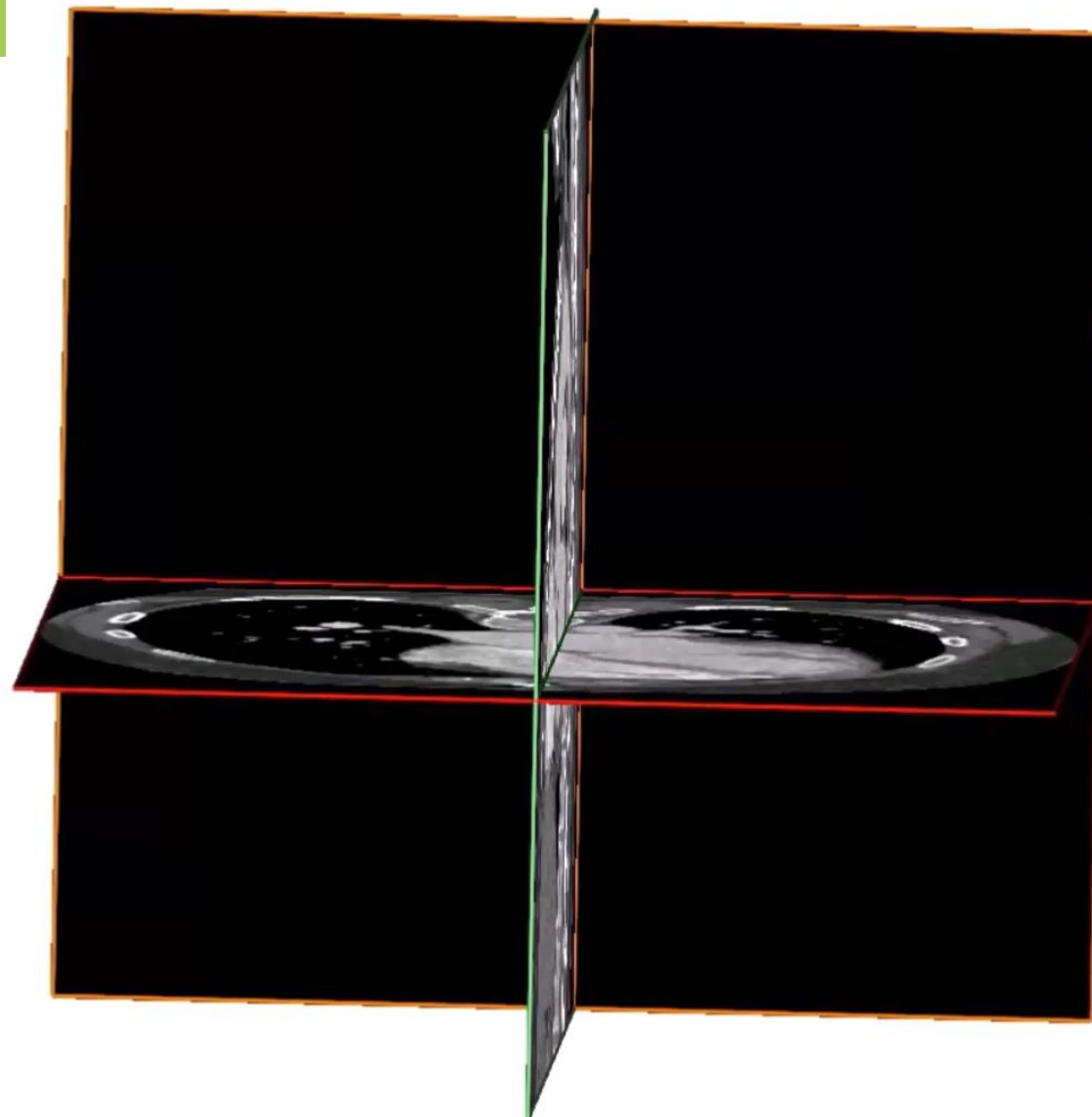
1. How we create our 3D models

1.1 Segmentation



1. How we create our 3D models

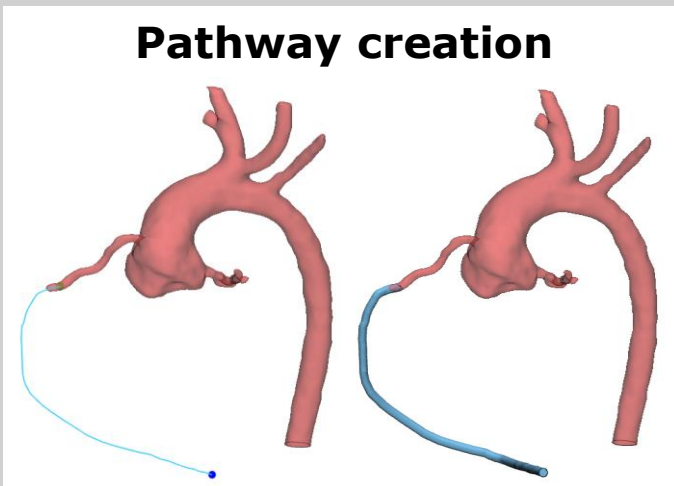
1.1 Segmentation



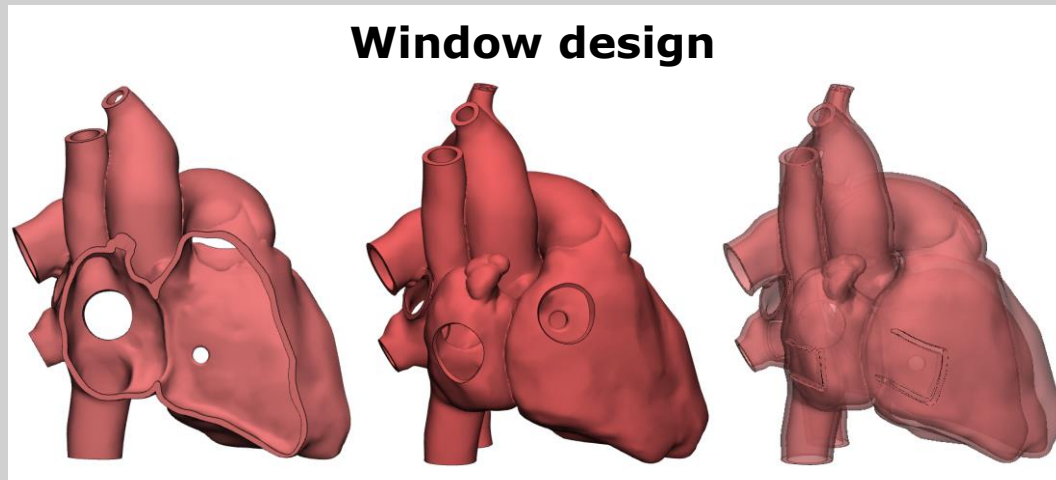
1. How we create our 3D models

1.2. Design

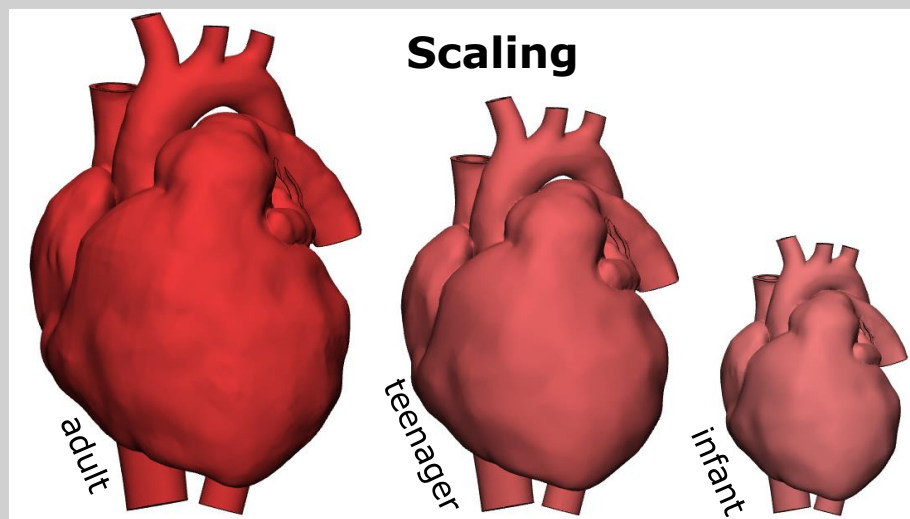
Pathway creation



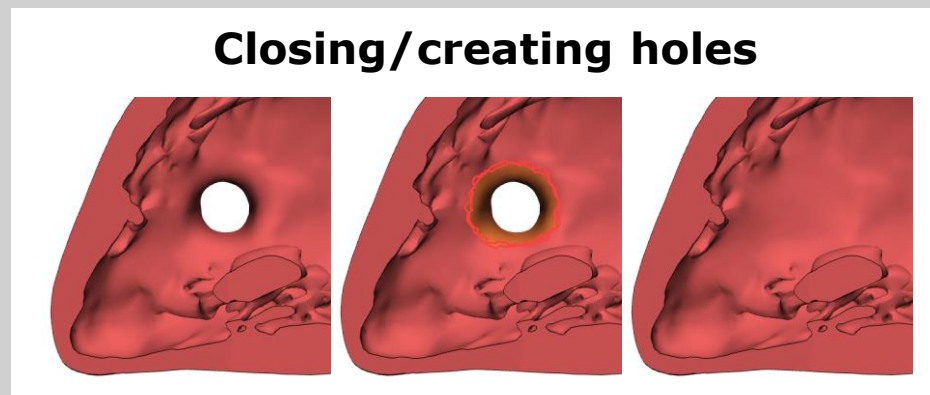
Window design



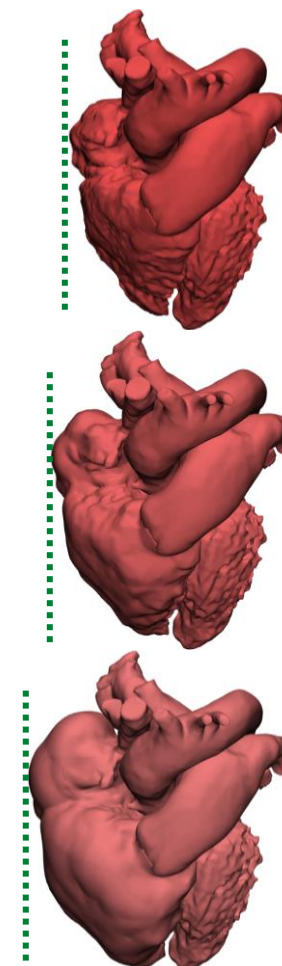
Scaling



Closing/creating holes



Local offset



1. How we create our 3D models

1.3 3D Printing

FDM (Fused Deposition Modeling)



Material:

- Stiff
- Opaque
- Bad surface quality

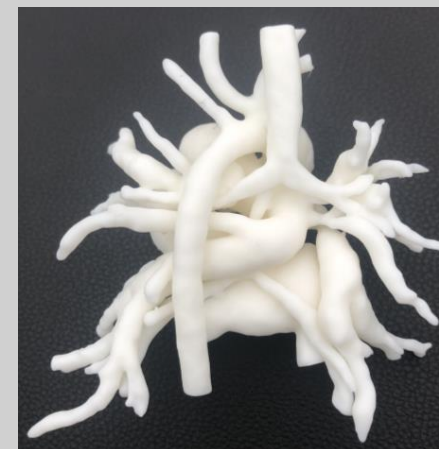
Material Costs (full heart model):

- Infant ~5€
- Teenager ~15€
- Adult ~20€

1. How we create our 3D models

1.3 3D Printing

Stereolithographie



Material:

- Flexible/stiff
- Opaque/transparent
- Biocompatible

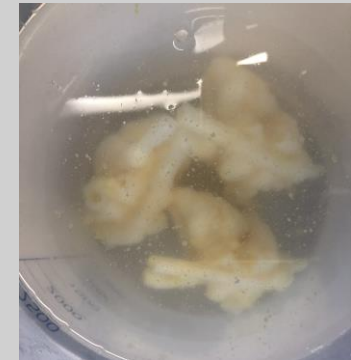
Material Costs (full heart model, White/Elastic):

- Infant ~15€/25€
- Teenager ~70€/80€
- Adult ~100€/130€

1. How we create our 3D models

1.3 3D Printing

Polyjet Printing



Material:

- Flexible/stiff
- Translucent
- Radiopaque
- Water-soluble support

Material Costs (full heart model):

- Infant ~150€
- Teenager ~420€
- Adult ~650€

2. Applications of 3D Printed Models in PC and PCS

2.1 Research: Device Testing

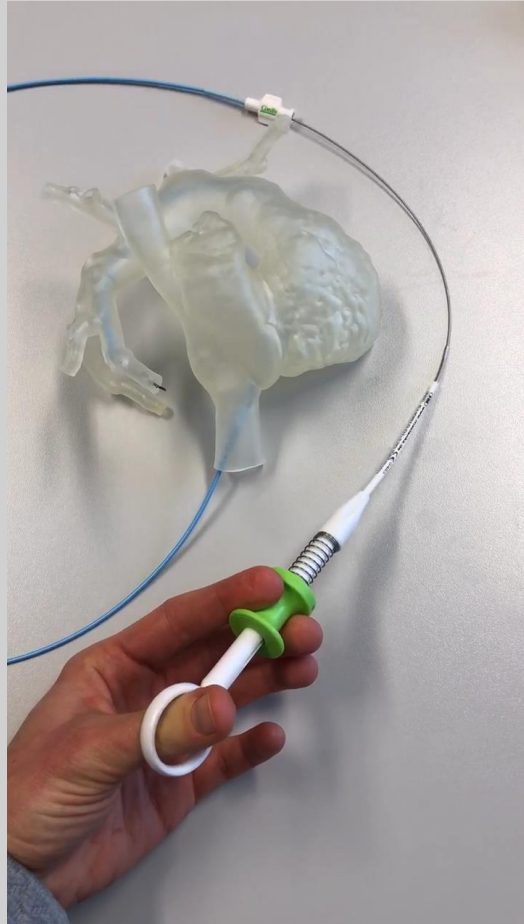
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2.1 Research: Device Testing



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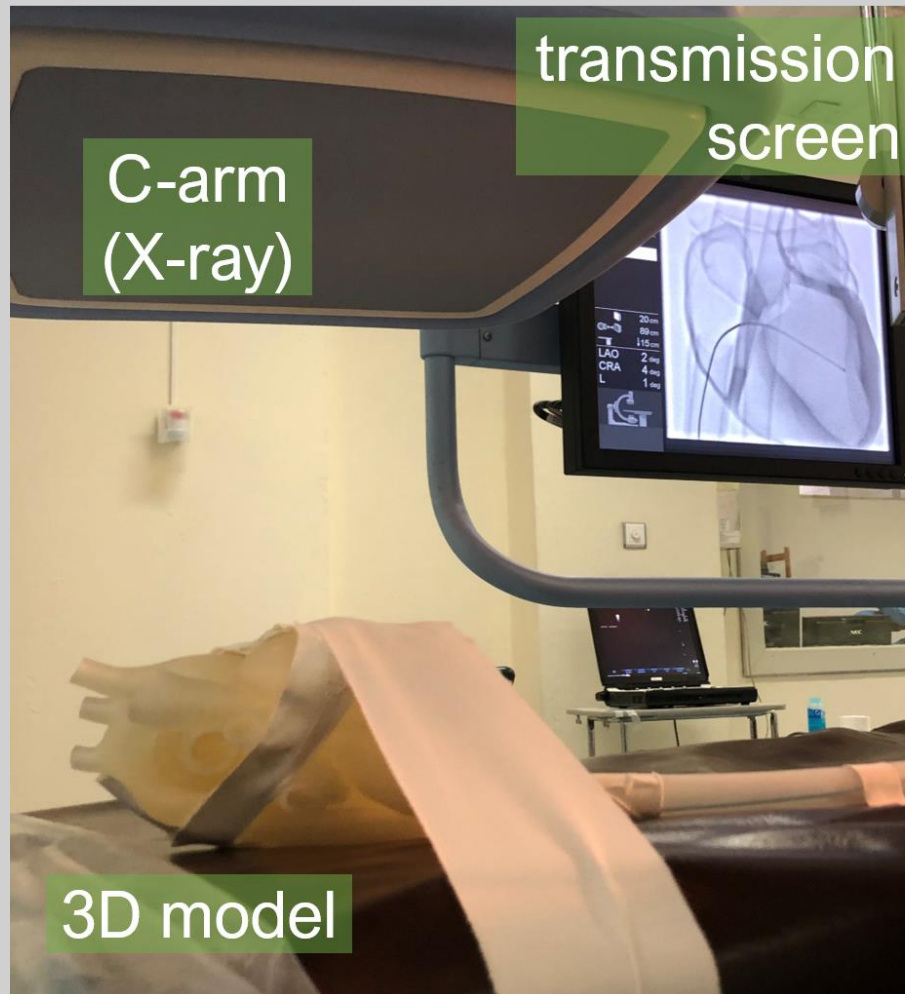


2. Applications of 3D Printed Models in PC and PCS

2.2 Training: Hands-on Catheterization Training

2. Applications of 3D Printed Models in PC and PCS

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2. Applications of 3D Printed Models in PC and PCS

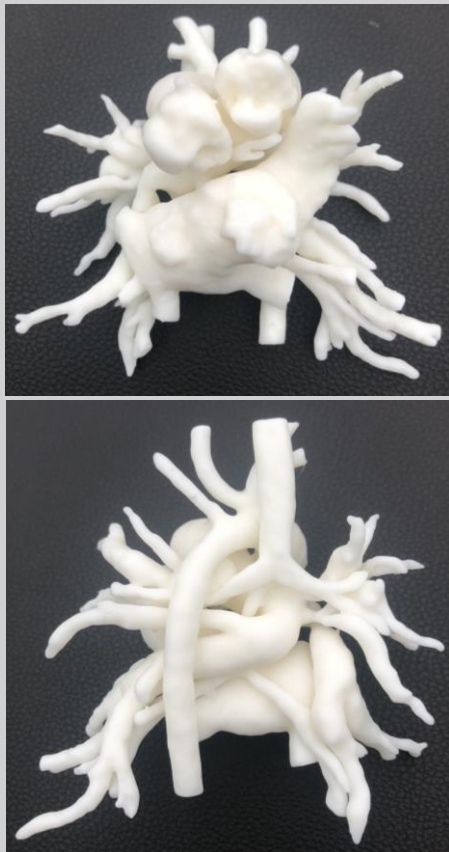
2.2 Training: Hands-on Catheterization Training



2. Applications of 3D Printed Models in PC and PCS

2.3 Patient Care: Surgical Planning

Double bifurcation of the trachea



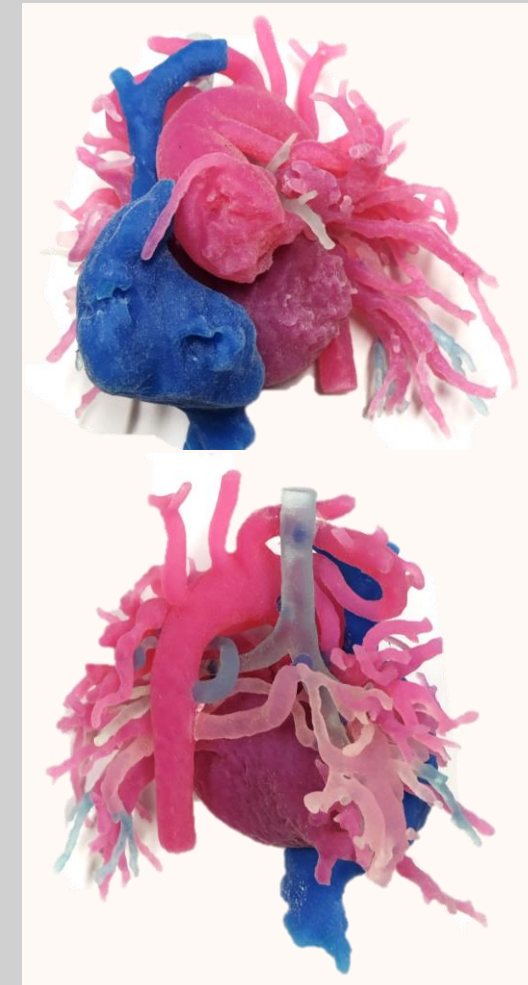
Aortic stenosis



Compression of the LCA through RV-PA conduit



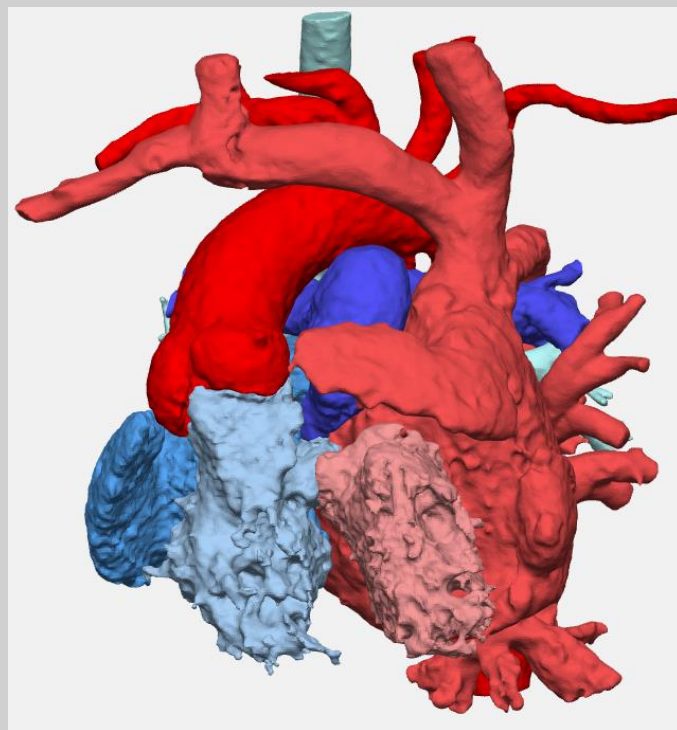
MAPCAs



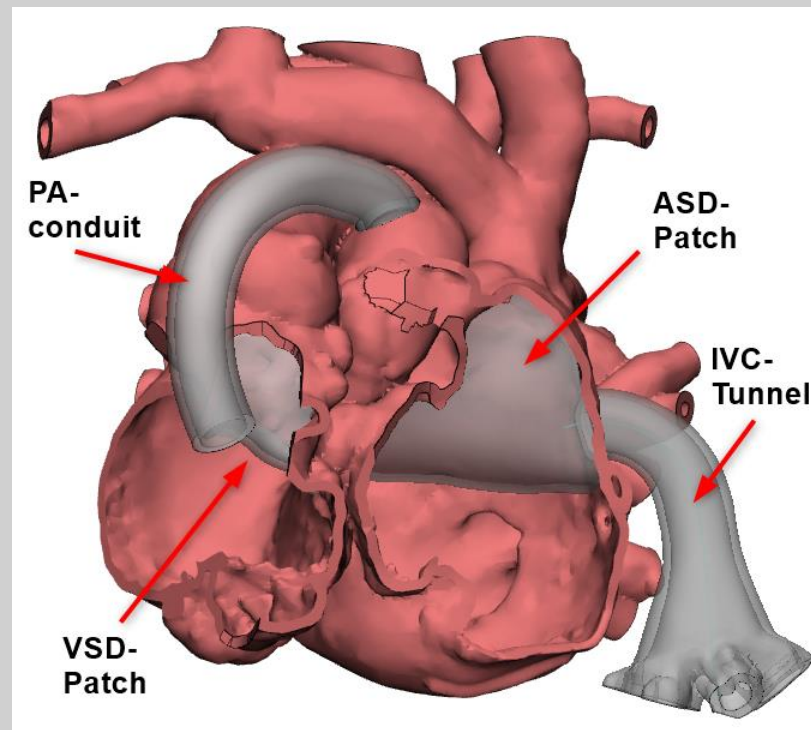
2. Applications of 3D Printed Models in PC and PCS

2.3 Patient Care: Surgical Planning

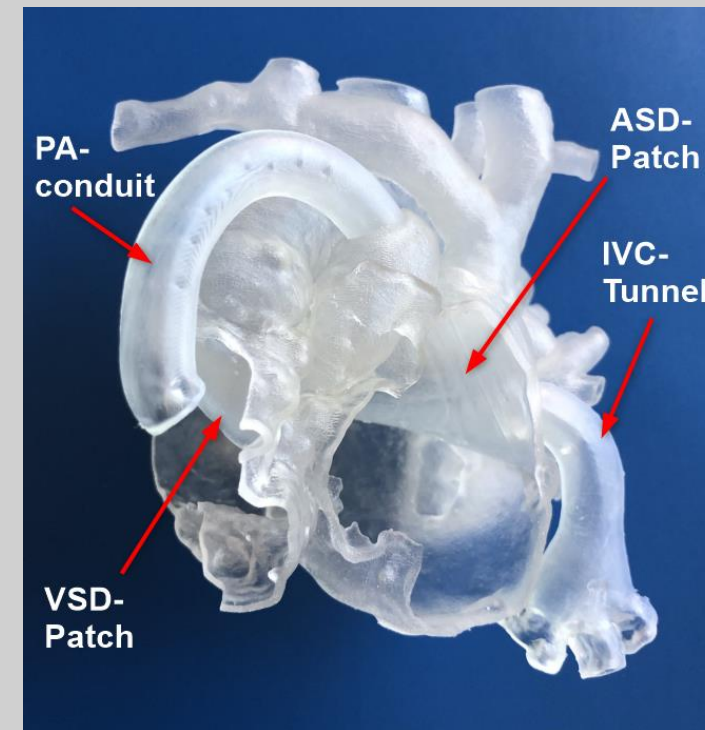
Segmentation



Surgical simulation



3D model



3. Why 3D Printing?

Freedom of design

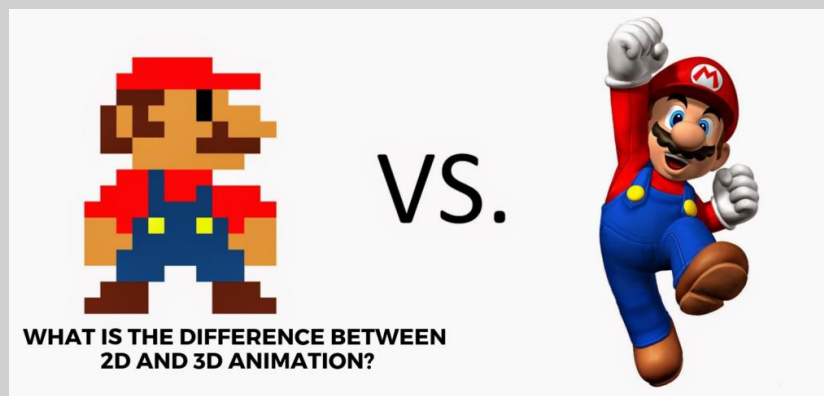
- Adaptation to training level and goals
- printing of any geometry



http://www.fair-price-shuttle.de/images/Fotolia_73102537_XS.jpg

3D visualization

- complex anatomy easier to understand
- measurements in 3D



https://pixelloid.com/blog/wp-content/uploads/2018/11/What-is-the-difference-between-2d-and-3d-animation_-1024x483.png

Individualization

- Patient-specific modeling for congenital heart disease



<https://www.laurencmiller.com/blog/2018/4/26/individualization-my-inner-maestro>

→ 3D printing in pediatric cardiology and cardiac surgery

**Thanks
for your attention!**

