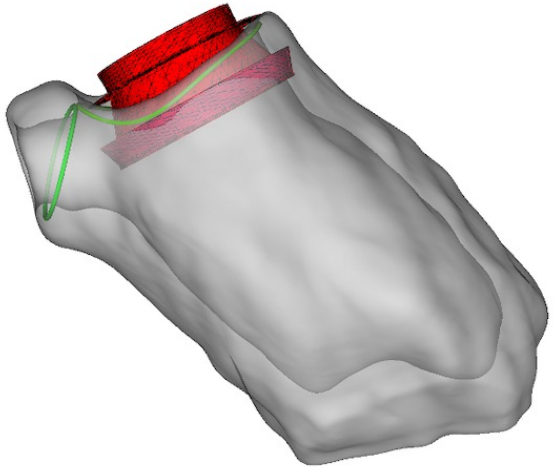
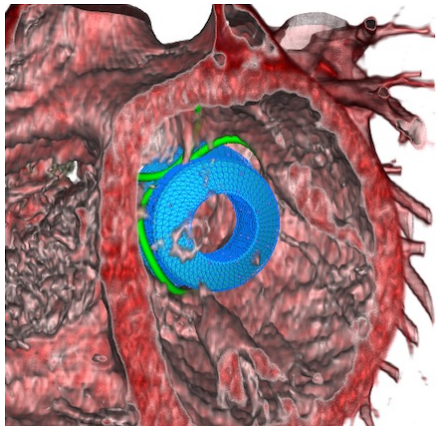
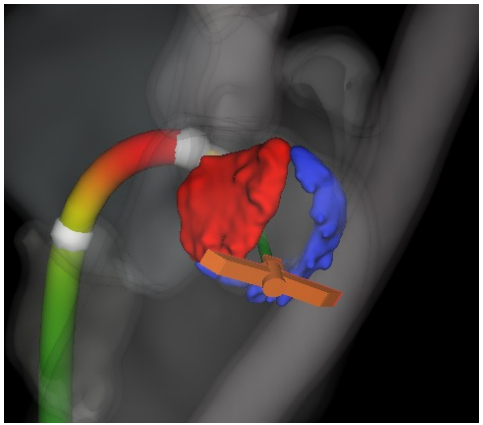
Multimodality Imaging for Surgical and Interventional Planning







Matthew Jolley, MD

Assistant Professor

Pediatric Cardiac Anesthesia and Pediatric Cardiology (Imaging)

Children's Hospital of Philadelphia

University of Pennsylvania Medical School

Children's Hospital of Philadelphia

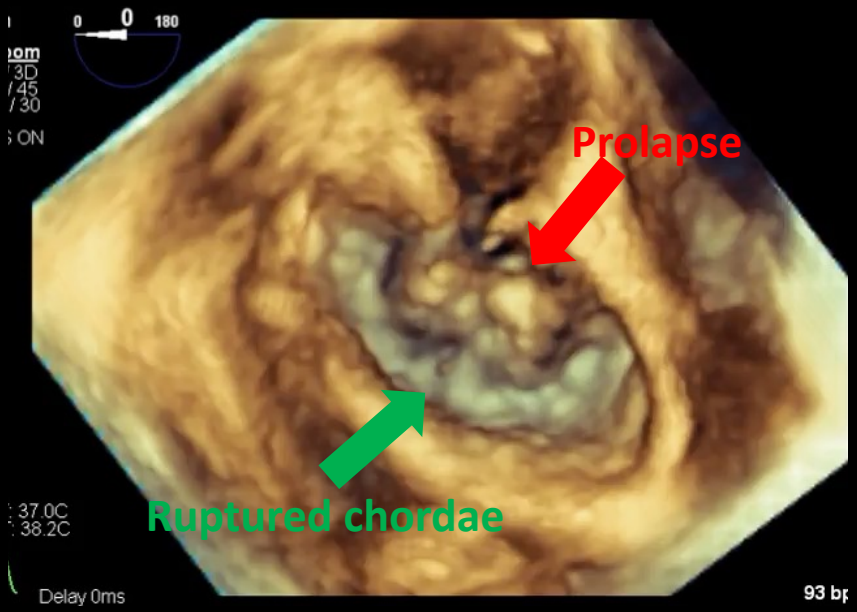
Perelman School of Medicine University of Pennsylvania

NO CONFLICT OF INTEREST OR FINANCIAL DISCLOSURES

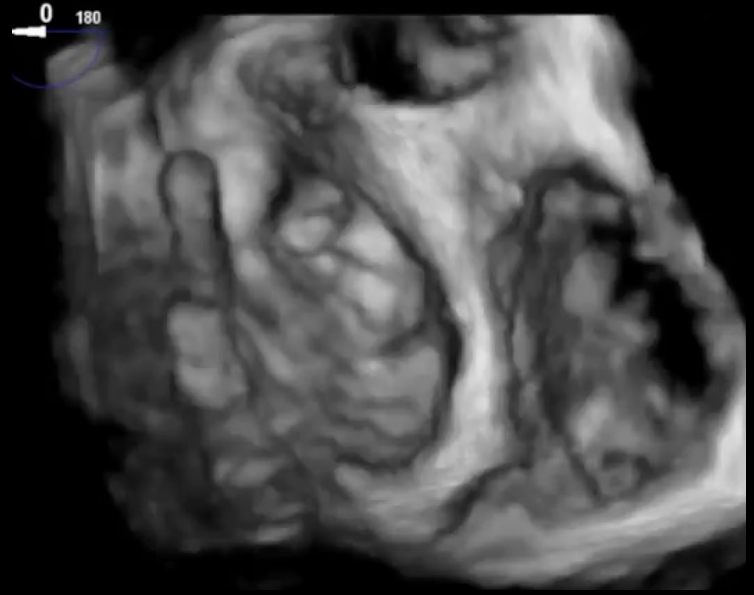
THE PROBLEM

- Diverse and growing population of CHILDREN and YOUNG ADULTS affected by structural heart and valve disease.
- Given the number of proposed procedures, complexity, and needed duration of studies, it is unlikely that procedural optimization will be achieved by prospective clinical trials.

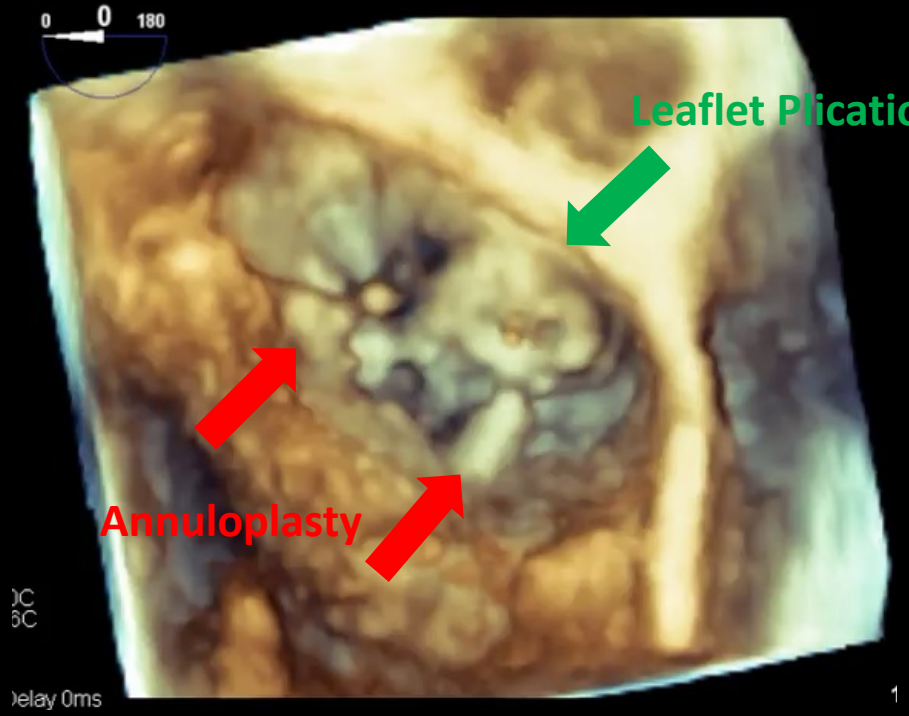
Customized Therapy for Each Patient



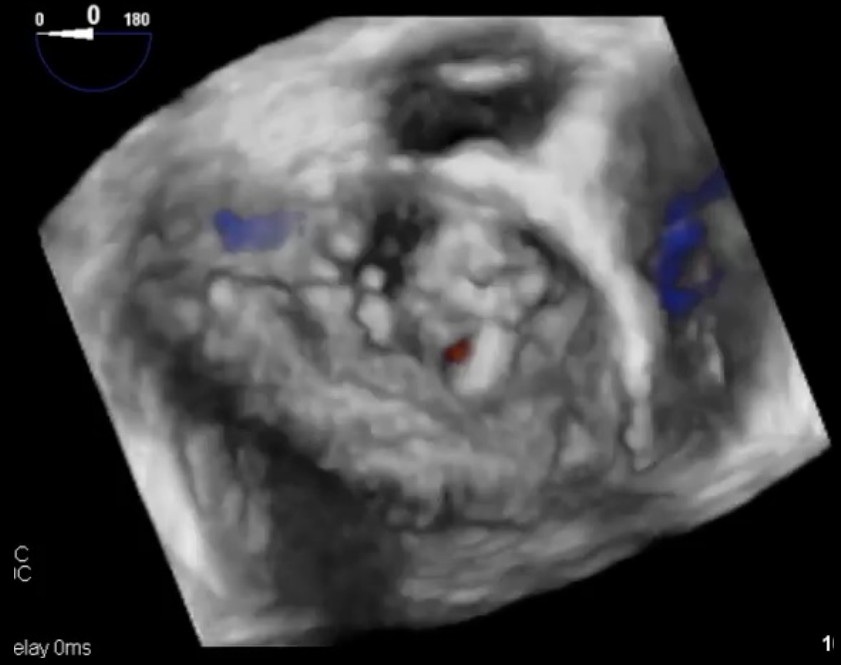
Atrial View



Atrial View



Atrial View



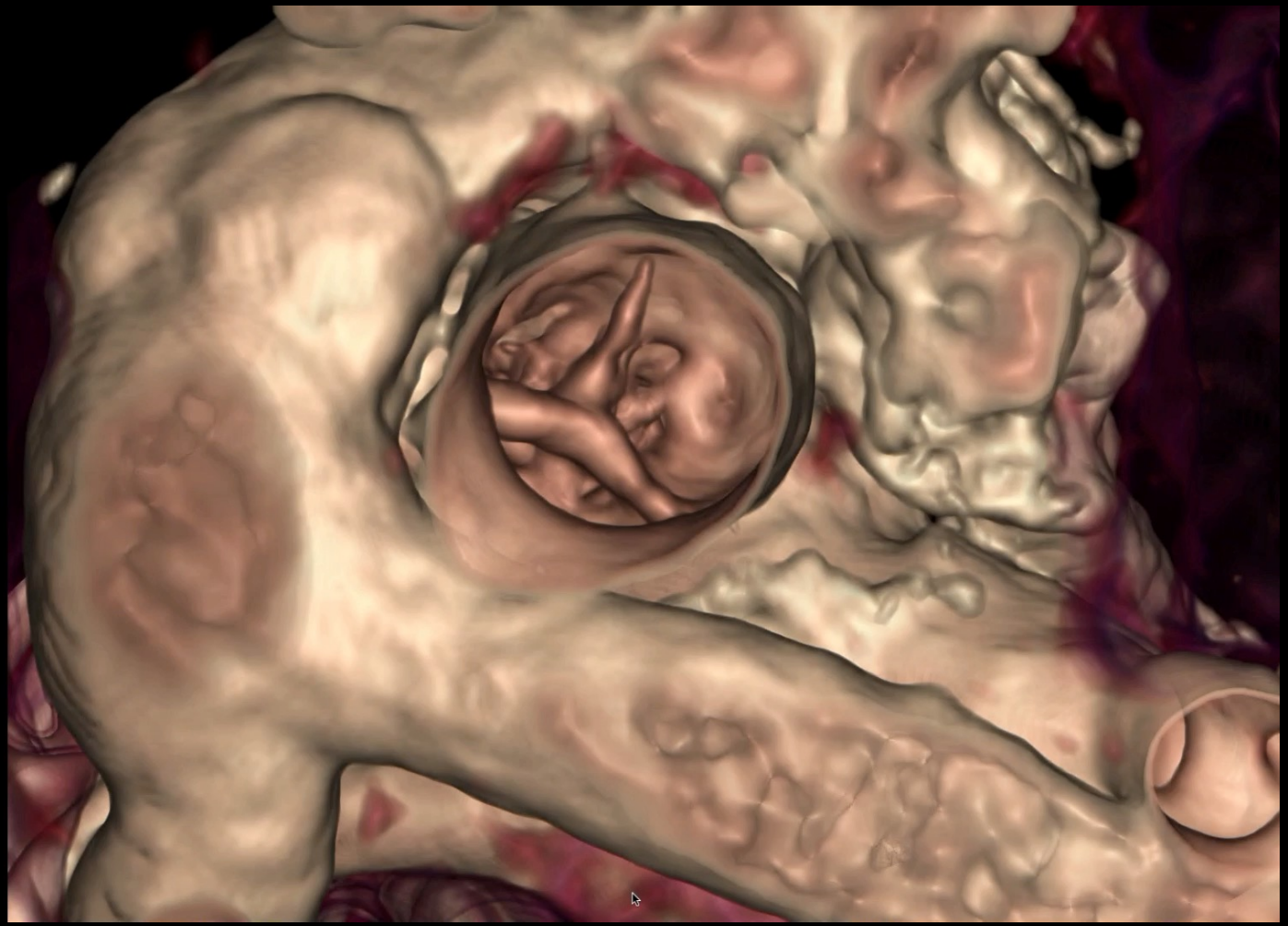
Atrial View

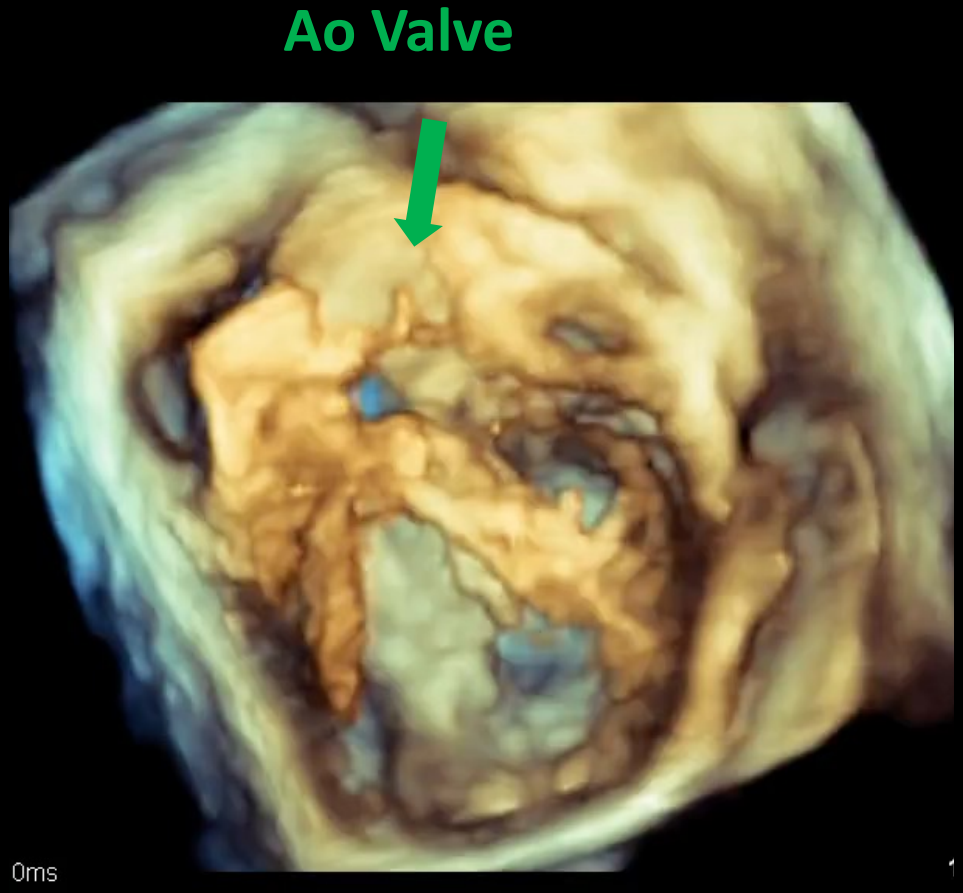
What about Semilunar Valves?

Standard Pre-operative Imaging using 2D and 3D Transesphogeal Echocardiography

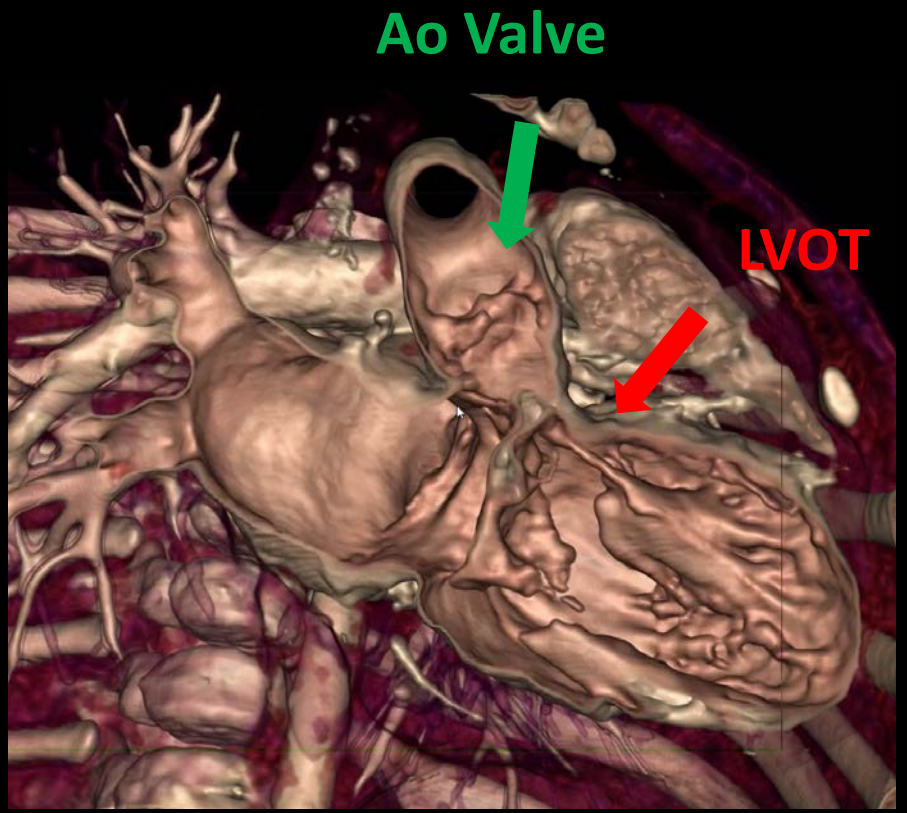
Williams et al, Circulation Imaging, 2022.

Evolving Tools for Virtual Valve Repair

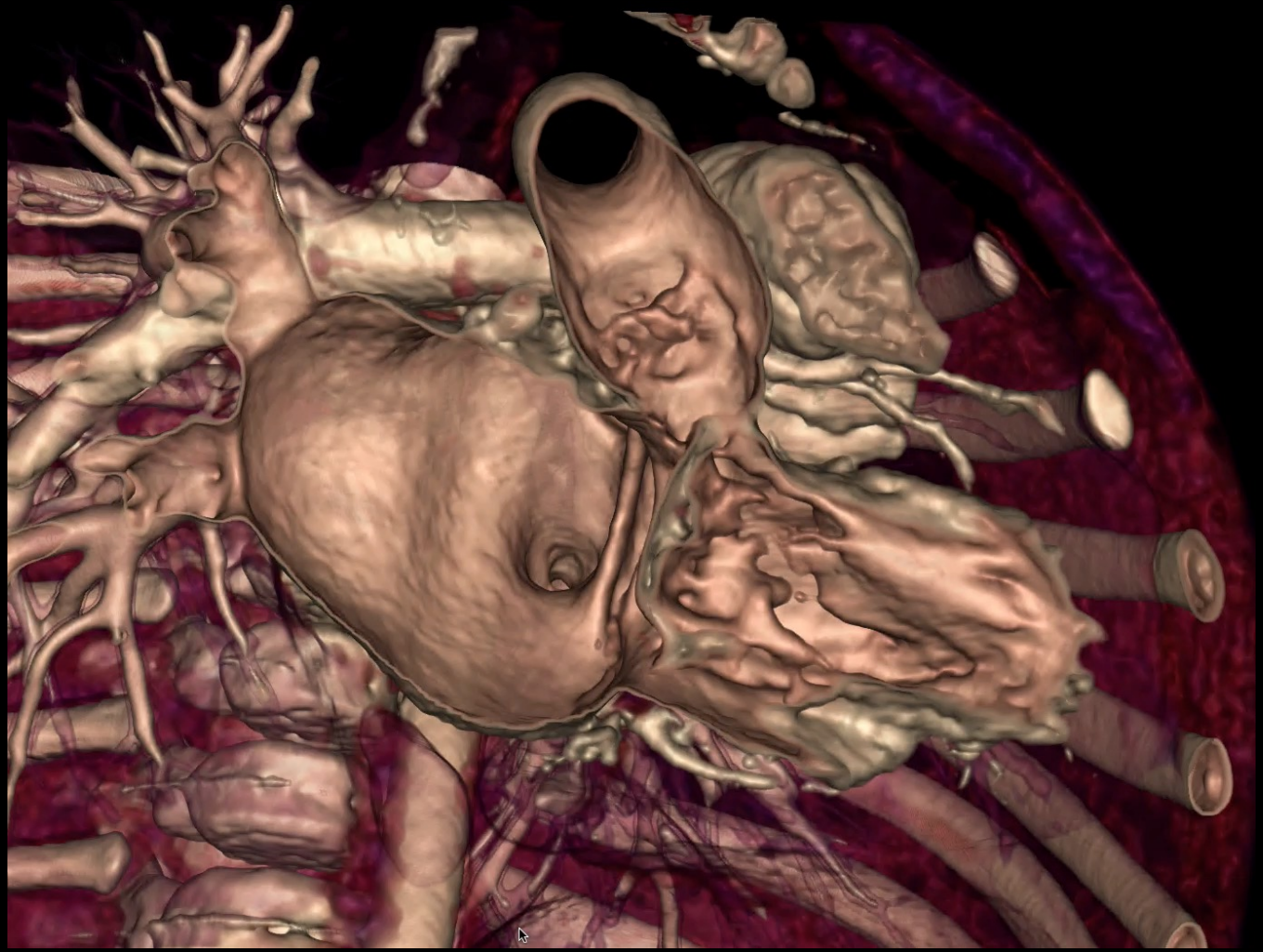


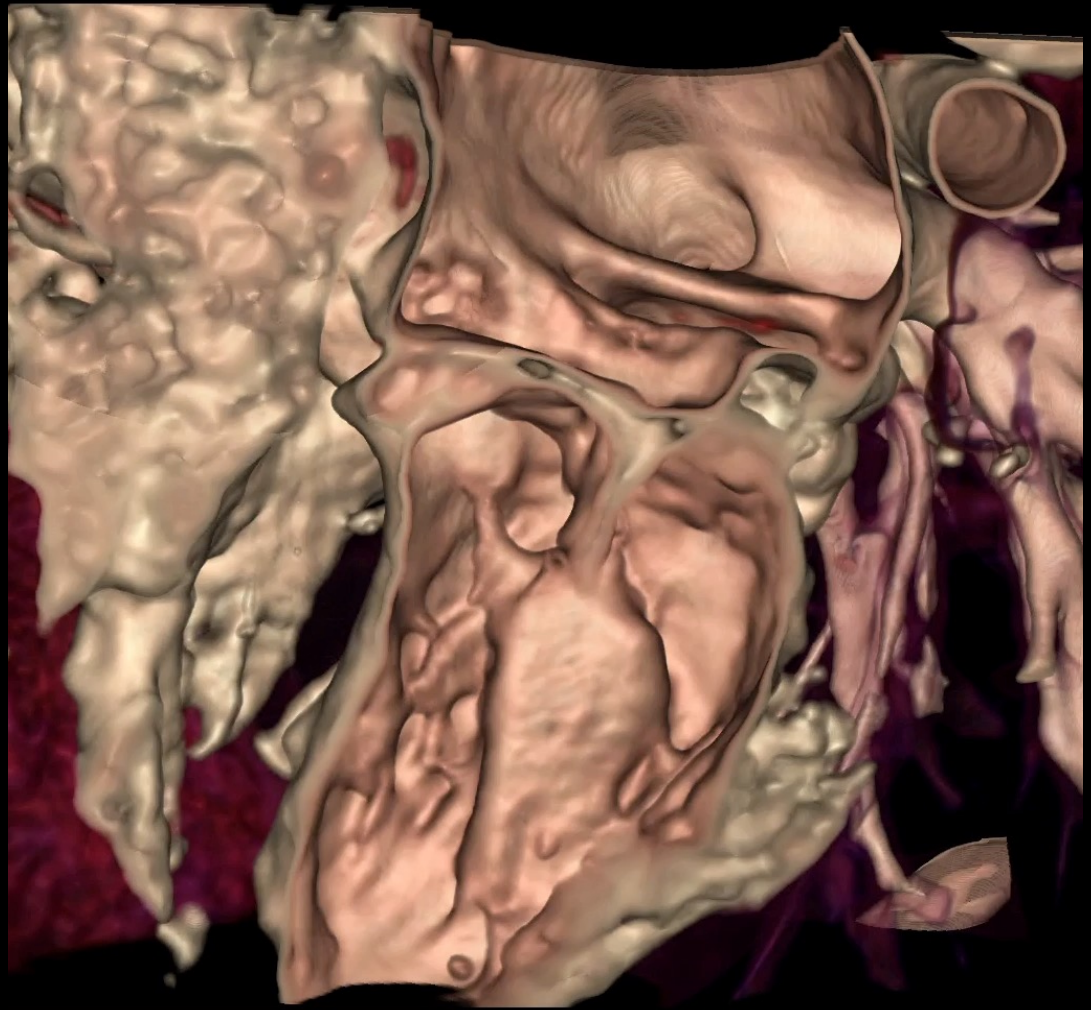


ECHO



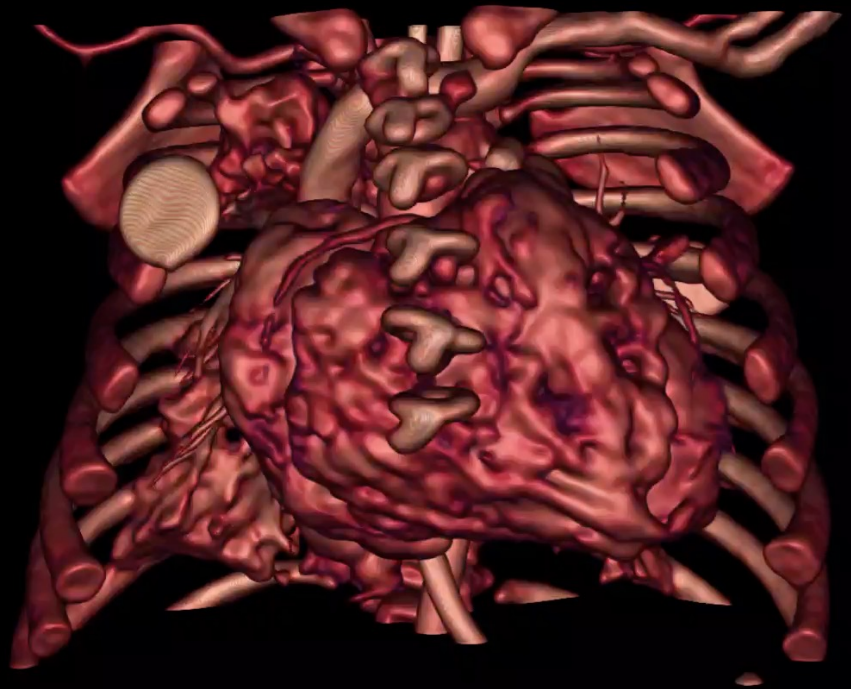
CT

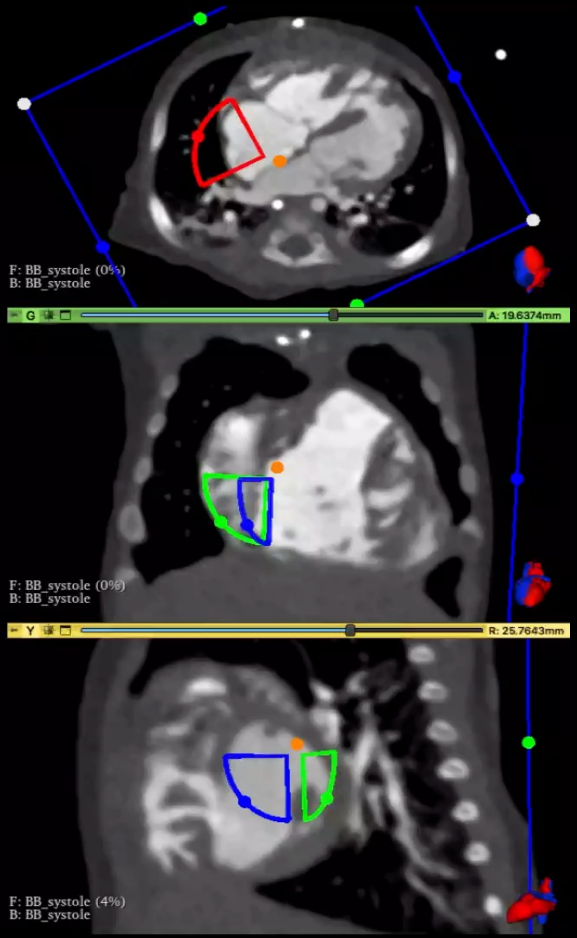




Complex VSDs

Standard Pre-operative Imaging using 2D and 3D Transthoracic Echocardiography





Cianciulli et al., in preparation, 2023

3D Slicer

Help & Acknowledgement

Parameter node: AsdVsdDeviceSimulator

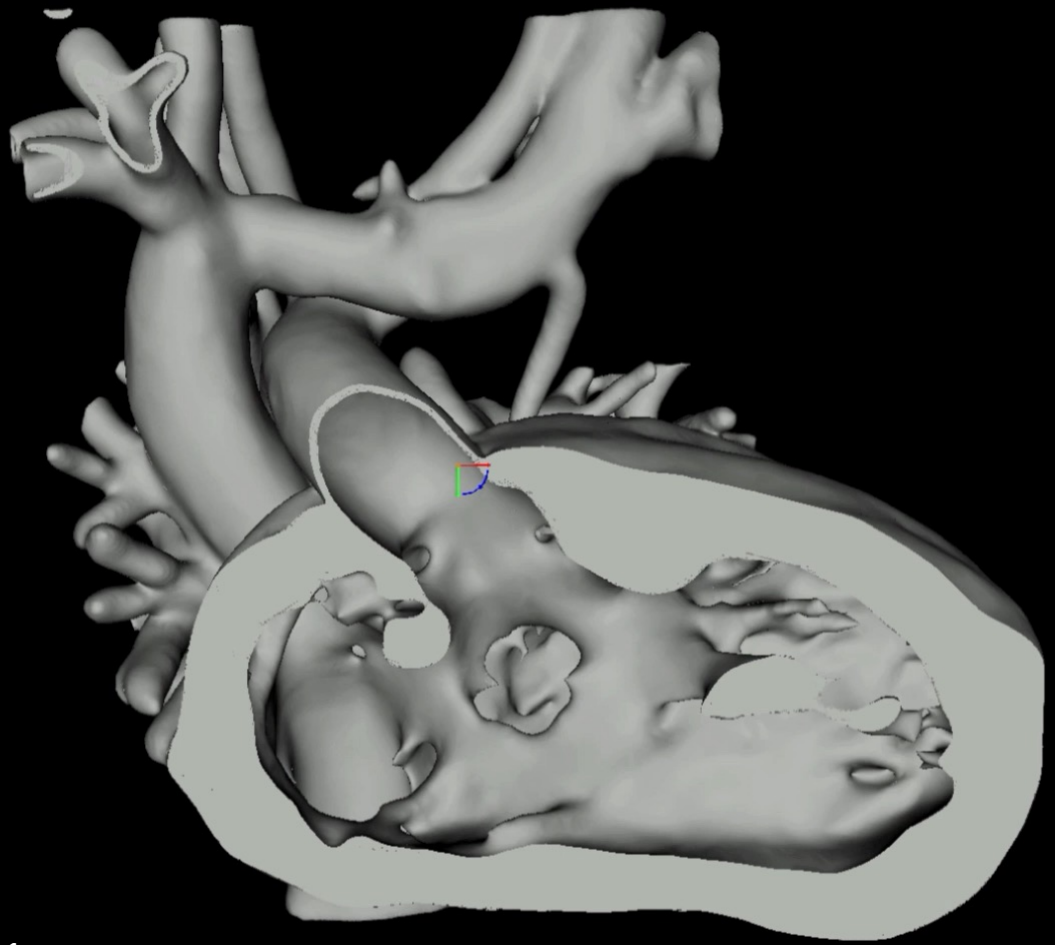
Device Selection

Device Name: *Muscular VSD Occluder*

Presets:

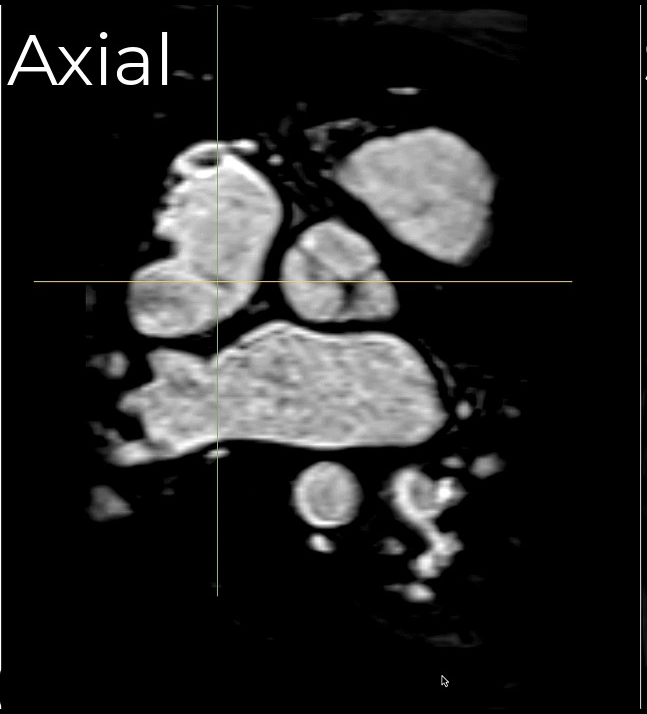
Inner diameter 5.00mm

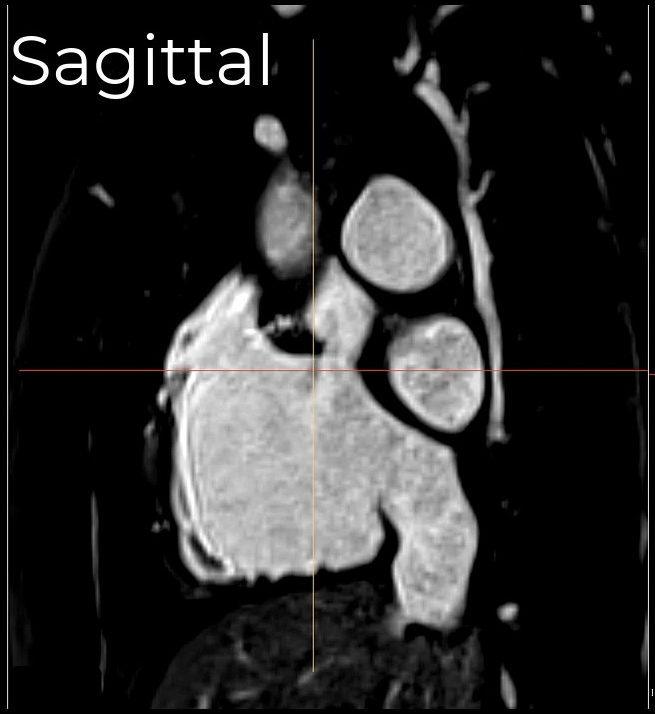
Skirt diameter 14.00mm

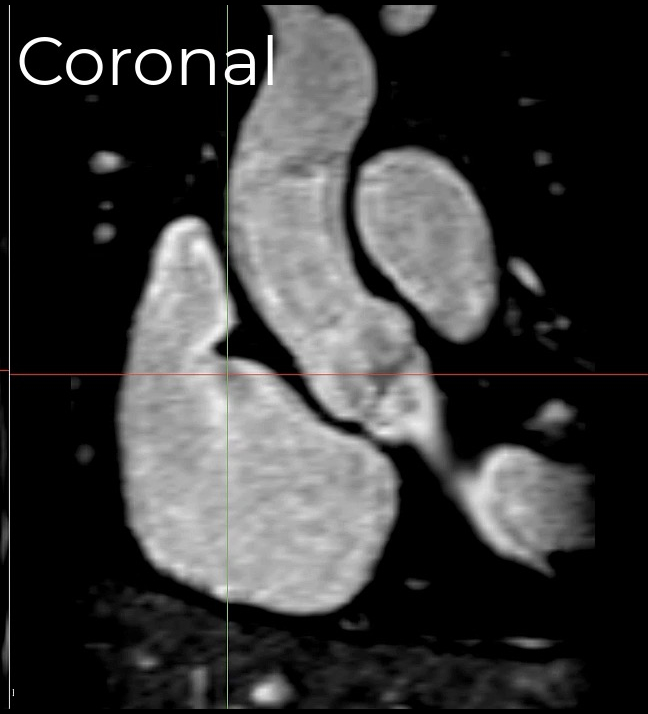


Vigil et al, ATS, 2021

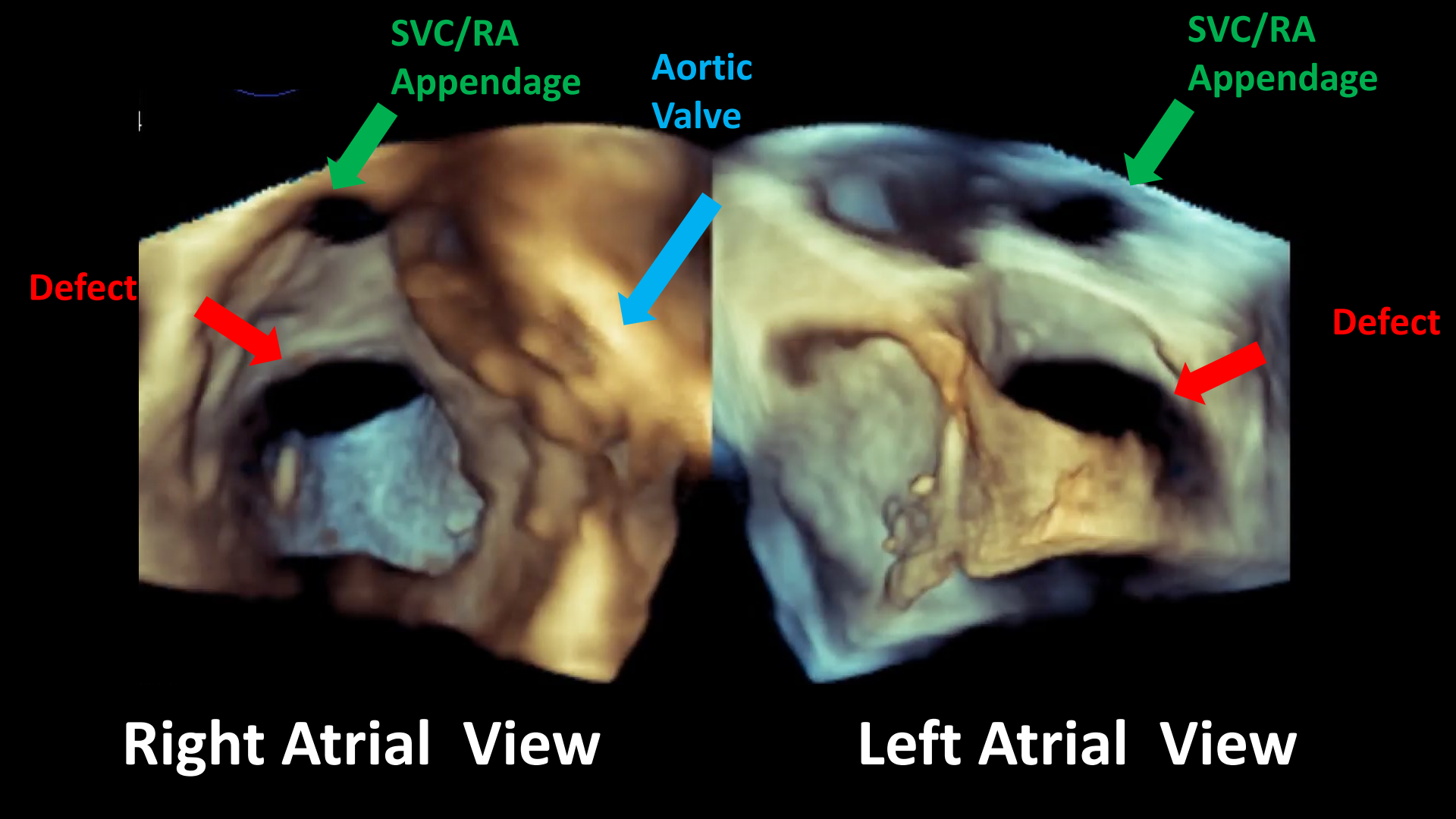
How to Match an “Off the Shelf” Therapy to an Individual


Axial


Sagittal

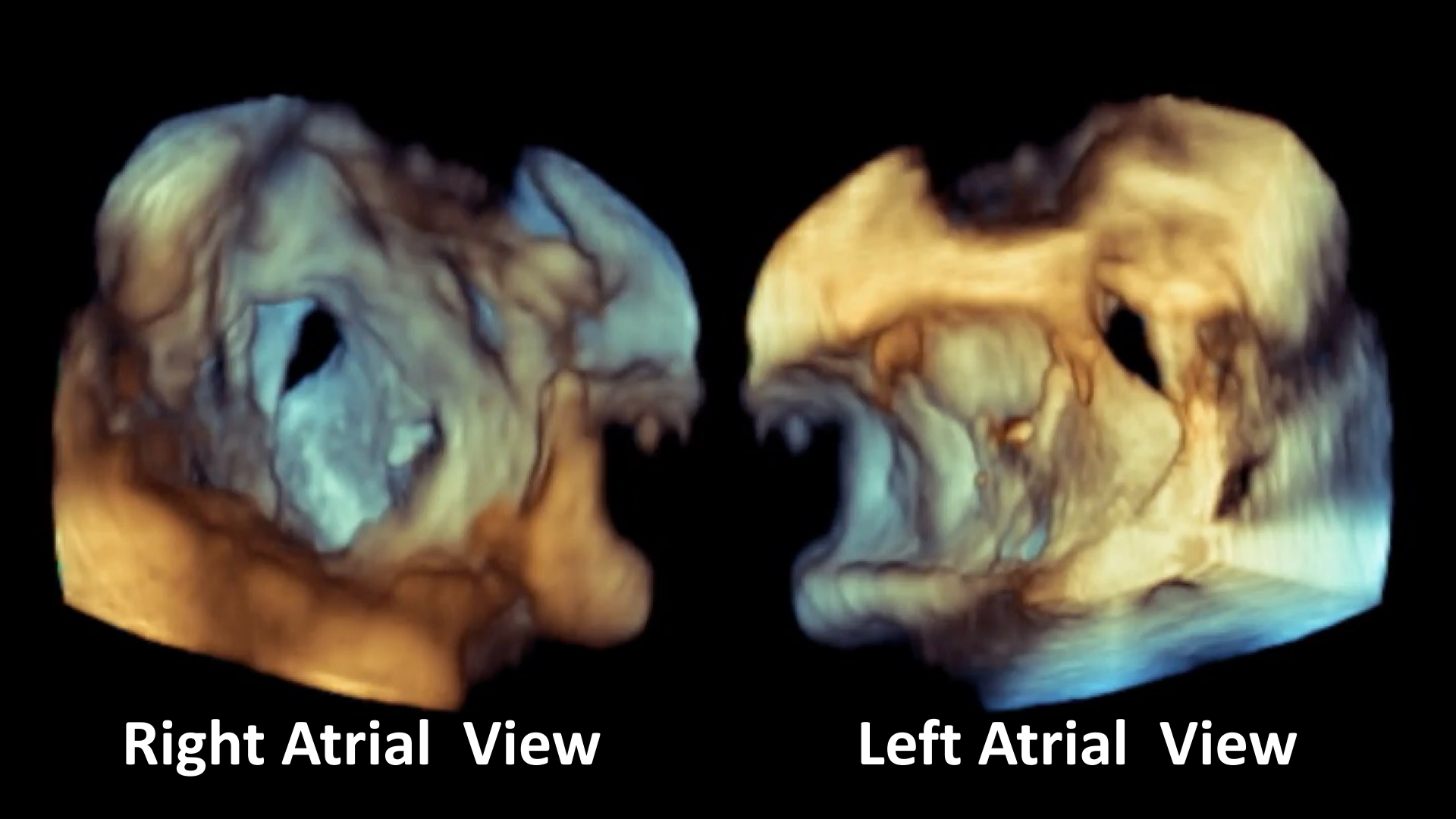

Coronal

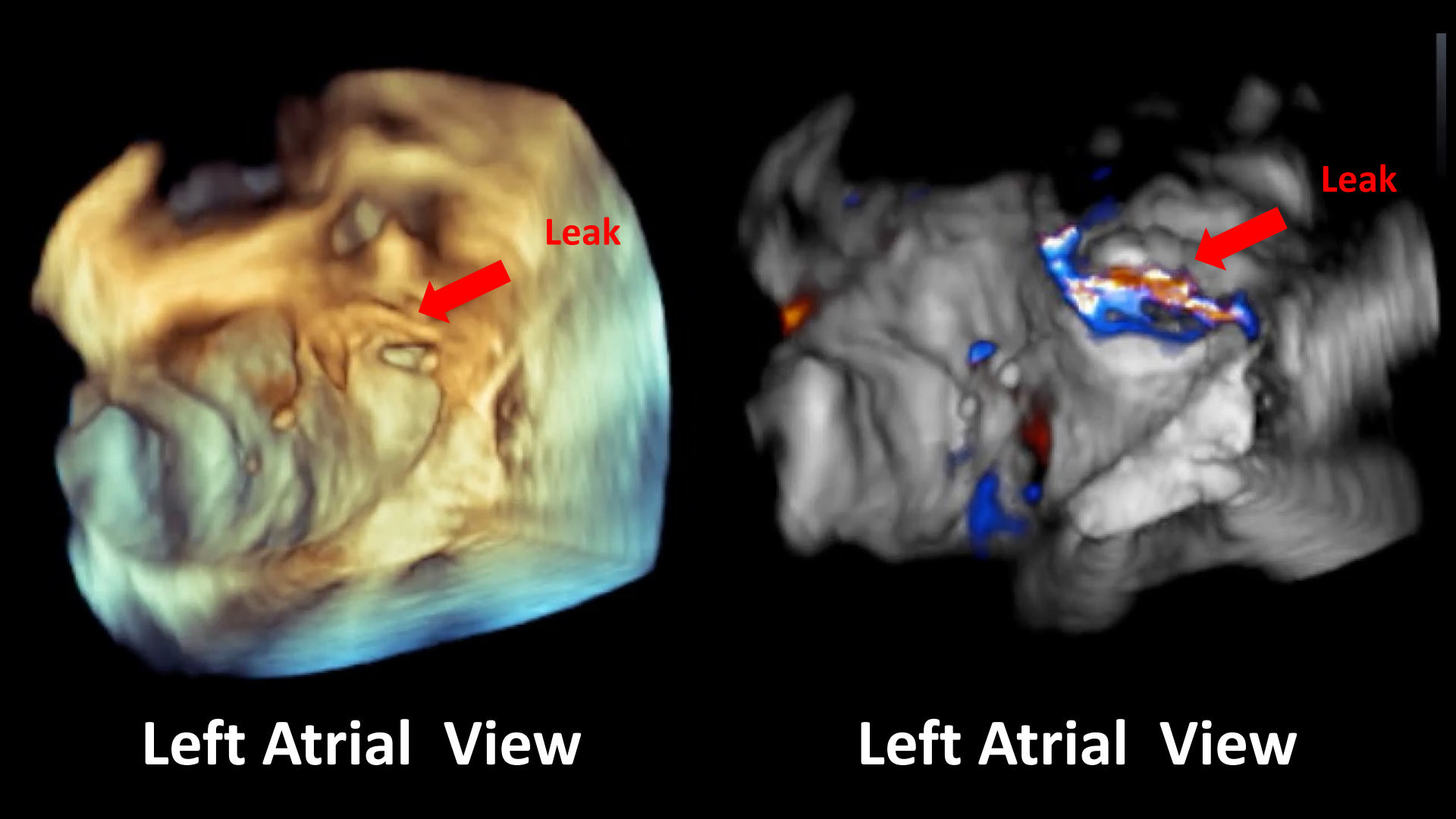
Patient Anatomy With 3D Modeling

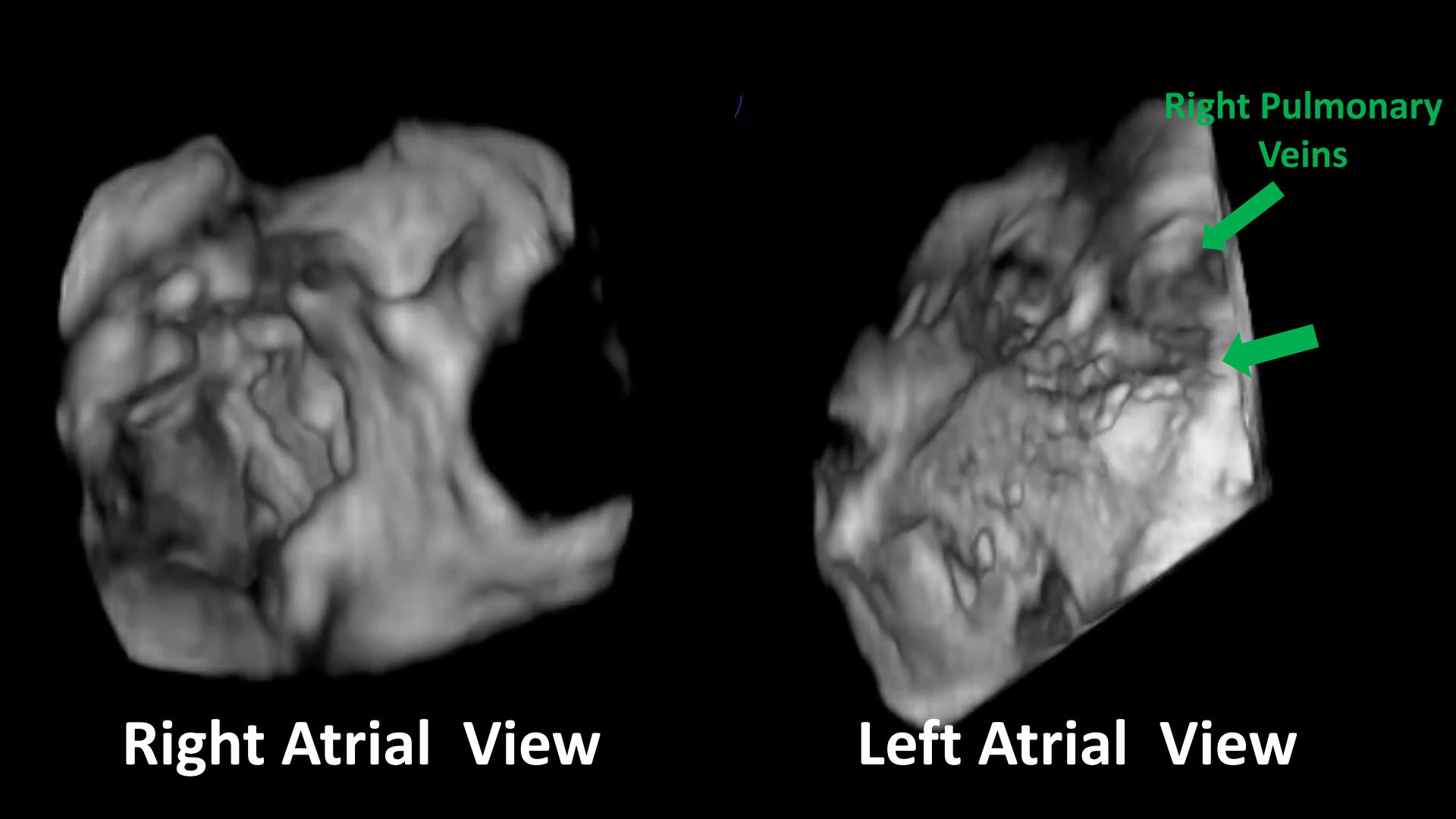

SVC/RA
Appendage
Aortic
Valve
SVC/RA
Appendage
Defect
Defect
Right Atrial View
Left Atrial View

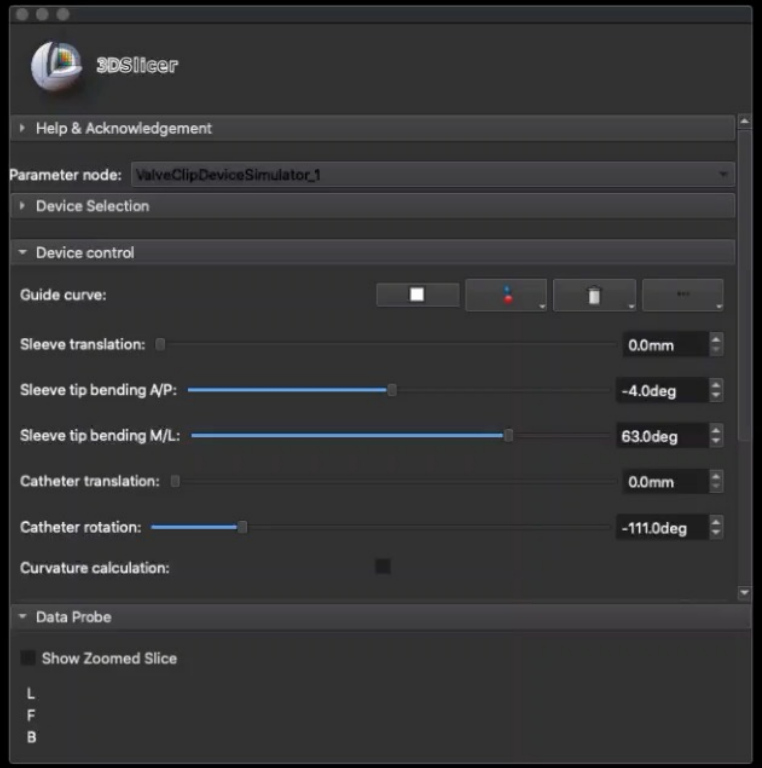
Right Atrial View

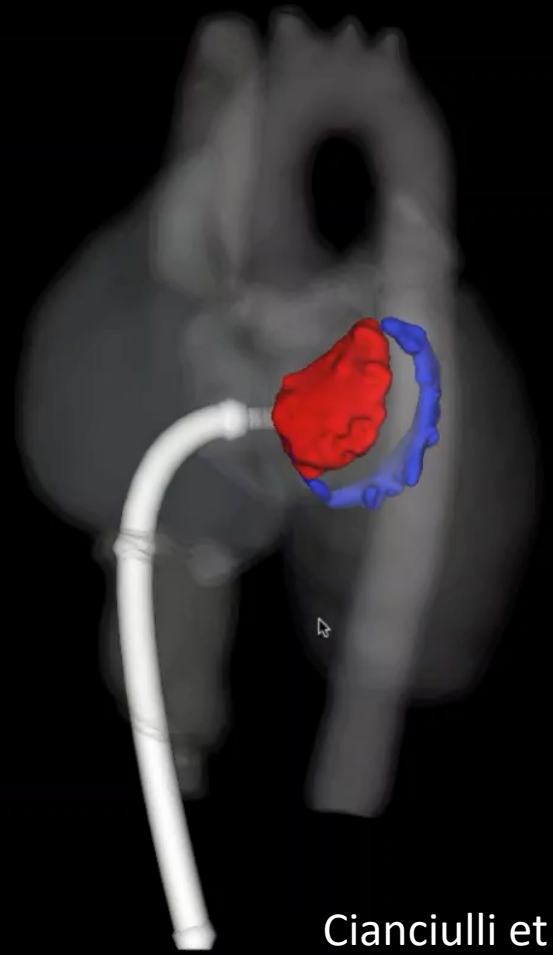
Left Atrial View


Right Atrial View
Left Atrial View


Leak
Leak
Left Atrial View
Left Atrial View


Right Pulmonary Veins
Right Atrial View
Left Atrial View

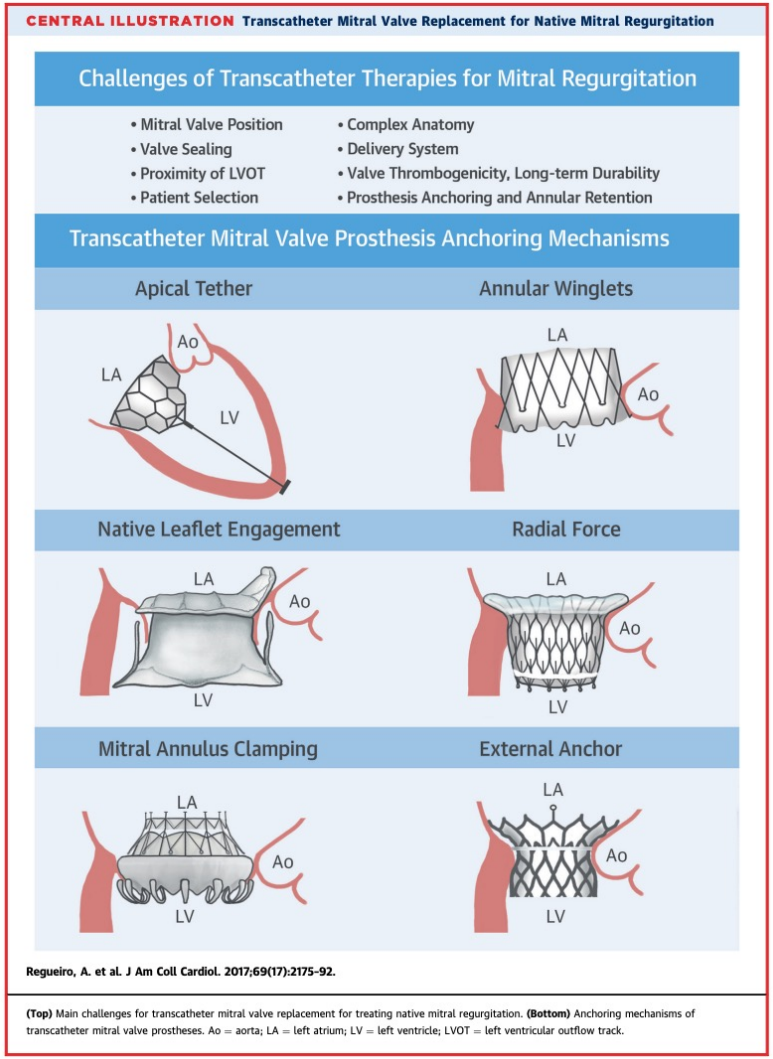




Cianciulli et al, JASE, 2021.

Application of Virtual Clip Based Modeling in Patients with Palliated Congenital Heart Disease

Cianciulli et al, JASE, 2021



Regueiro et al, JACC, 2017

Device Selection

Herz et al, JASE 2021

Quantification of the PDA using 3D Slicer and SlicerHeart

Gupta et al. In preparation

Multimodality Images

+

Modeling

Thank You

JolleyLab

- Silvani Amin- Research Assistant
- Stephen Ching- Engineer
- Hannah Dewey- Undergraduate Student
- Christian Herz- Senior Developer
- Devin Laurence- Post Doc
- Hannah Nam- Med Student
- Patricia Sabin- Engineer
- Ana Sulentic- Research Assistant
- Wensi Wu- Post Doctoral Fellow
- Chris Zelonis- Undergraduate Student

Cardiac Imagers

- Michael Quartermain
- Lindsay Rogers
- Yan Wang

Cardiac Surgeons

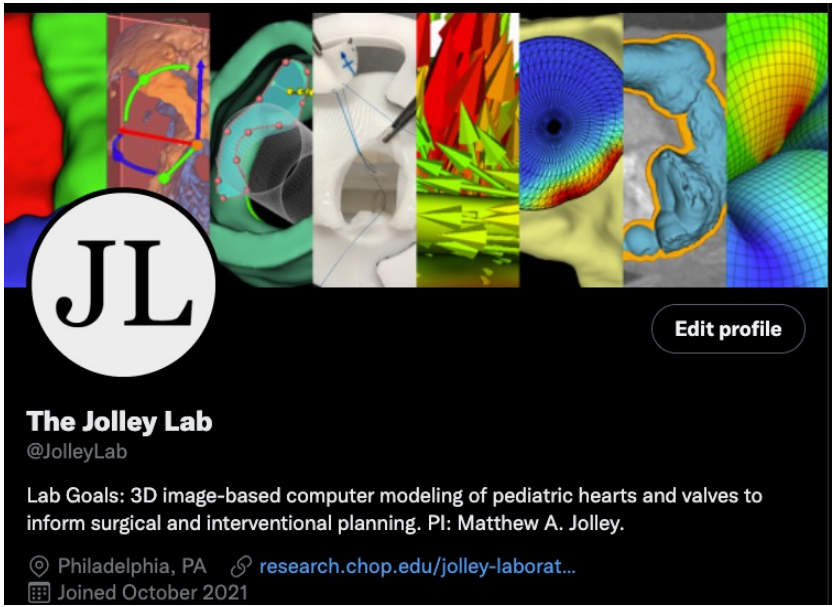
- Mo Nuri
- Jonathan Chen
- Constantine Mavroudis

Cardiac Interventionalists

- Matt Gillespie
- Michael O'Byrne

Cardiology Fellows

- Trevor Williams
- Reena Ghosh
- Mudit Gupta



https://twitter.com/JolleyLab/