



INNOVATION FLASHLIGHT

Multimodality CT Imaging, Planning and Guidance *for Heart Valve interventions*

André Plass

The presented technologies and techniques include the

- ***Heart- and Echonavigator of Philips Healthcare***
- ***3mensio of Pie Medical***
- ***Circle cardiovascular imaging***
- ***Osirix MD of Pixmeo***

Workshop Aims

- ✓ It is designed for theoretical know-how transfer as well as practical hands-on in the field of interactive multi-modality cardiovascular imaging.
- ✓ It is an interdisciplinary teaching and learning approach for better handling of CT based datasets and the understanding of opportunities by using specific imaging processing techniques of the latest generation.
- ✓ It is not only about understanding the mitral and tricuspid valve and related pathologies.
- ✓ It is about how to treat of the valve disease personalized to the patient, choose and prepare the optimal procedure and support the intervention interactively



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PHILIPS

Carlos Ruiz

Sahyoun Cherif

HeartNavigator

Name and manufacturer: HeartNavigator, Royal Philips, founded in 1891

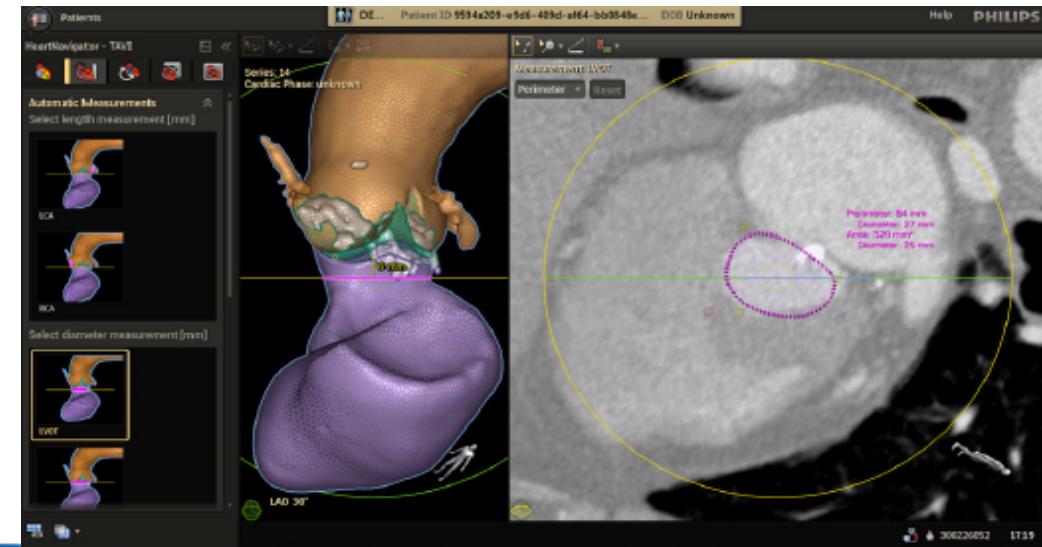
Approval status: CE mark, FDA approved in 2011

Technology Background: HeartNavigator was developed to assist with planning and live guidance of structural heart procedures using model-based CT algorithms. Originally built for TAVI, HeartNavigator has developed into a comprehensive multipurpose solution.

Technology Description: HeartNavigator creates an automatic 3D segmentation of the heart from CT. It simplifies sizing, device selection and projection angle selection. During the procedure, HeartNavigator provides live image fusion to support device positioning.

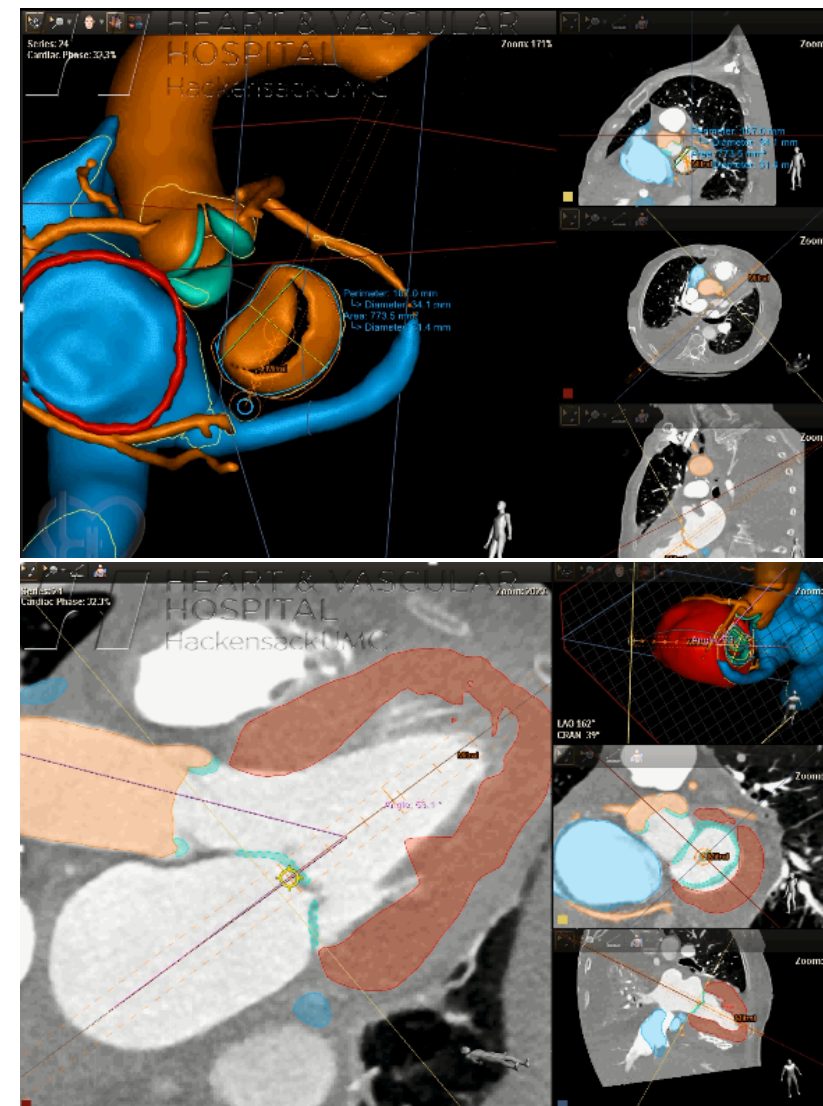
Available Modules: Aortic valve, LAA, Mitral valve, Tricuspid valve...

Working platforms: Philips workstation



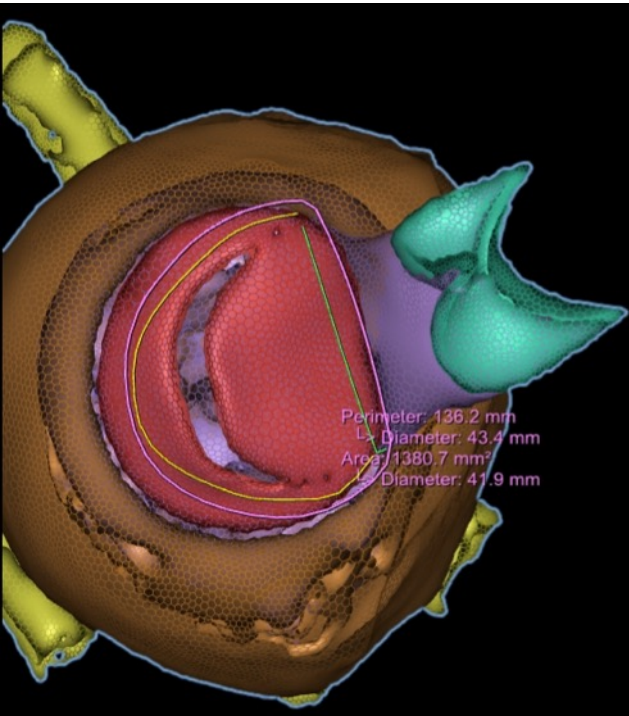
Philips Structural Heart/Mitral Valve

- **Basics:** Fully automatic anatomy segmentation and TAVI measurements. Virtual valve implantation. Optimal X-ray projection planning. Live overlay.
- **What is new:** Improved TAVI workflow and functionality. Mitral valve automatic segmentation, measurements of perimeter/area, LVOT obstruction visualization using virtual valve implantation. Trajectory visualization, etc.

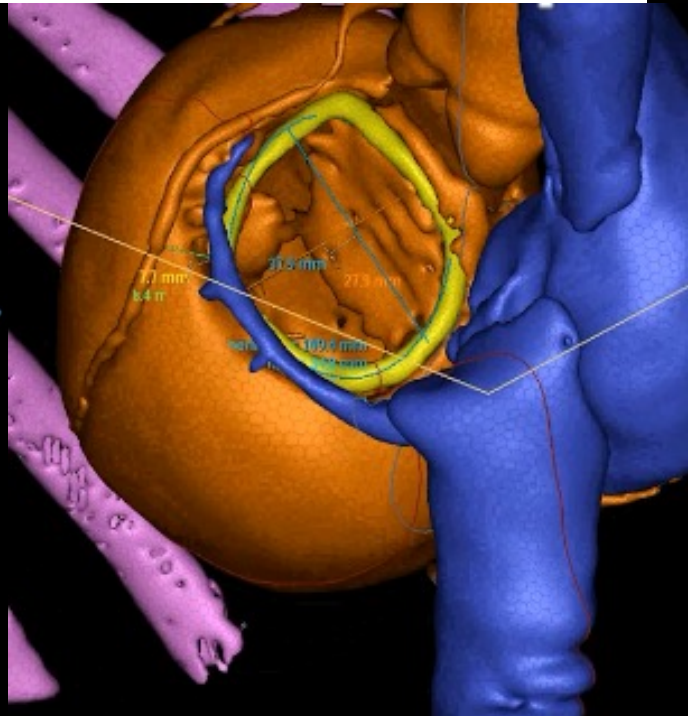


Case Example / Mitral

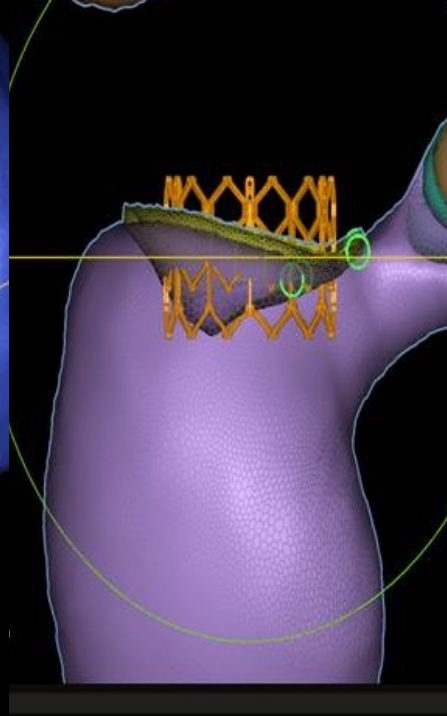
Annulus Assessment



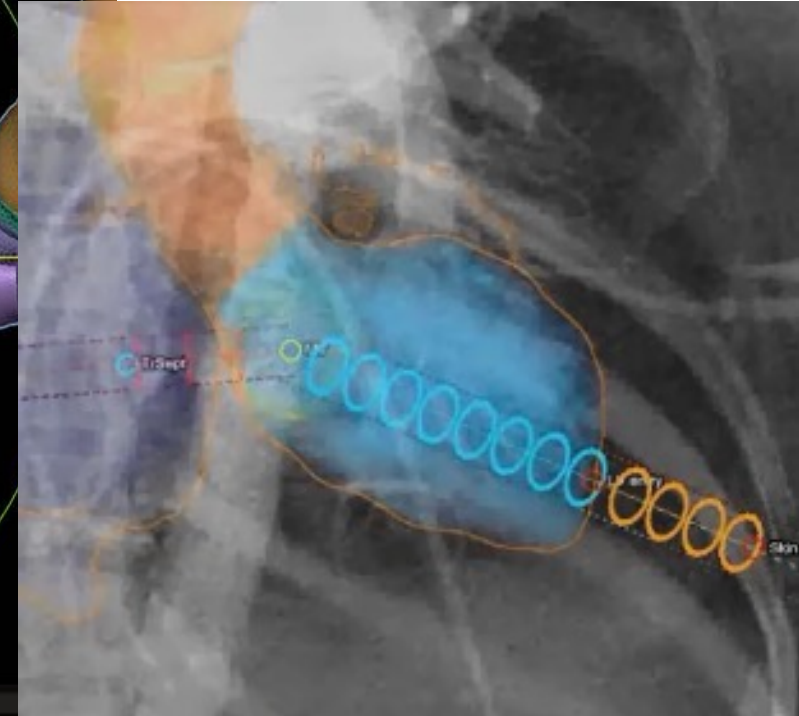
Interrelation to coronary sinus
and circumflex artery



LVOT obstruction
Assessment



Trajectory planning and overlay





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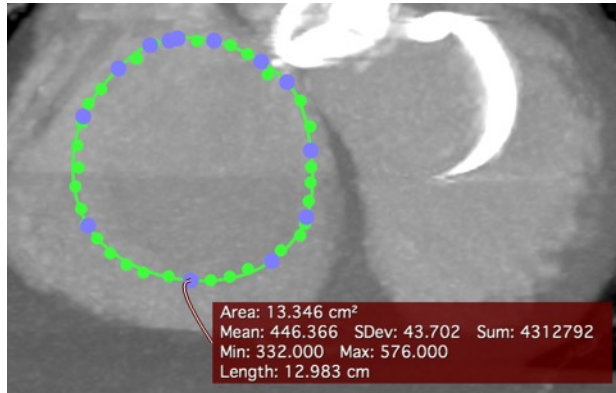
Osirix CT Assessment

Tricuspid valve specific
The 4Tech Experience

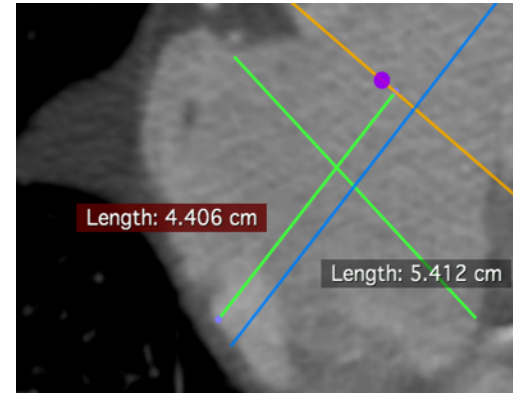
Osirix Technology

- Use Osirix to plan the procedure for Tricuspid Procedure
 - Define insertion location for the implant
 - Size the stent correctly, size and implantation location
 - Understand the dimensions of the right atrium for steering/access
 - Determine the fluoro projections that allow visualisation of the valve
- Open & display all medical images, produced by medical equipment: CT, MRI, US, XA, RX, PET-CT, SPECT-CT, ...
- Fully DICOM File compliant. Read all syntaxes, including compressed syntaxes: JPEG, JPEG-LS, JP2K, RLE, ...
- Certified as FDA & CE medical device software, class II, for diagnostic imaging
- No specific hardware requirement, compatible with all OS X computers

CT review for the TriCinch system: Understanding dimensions



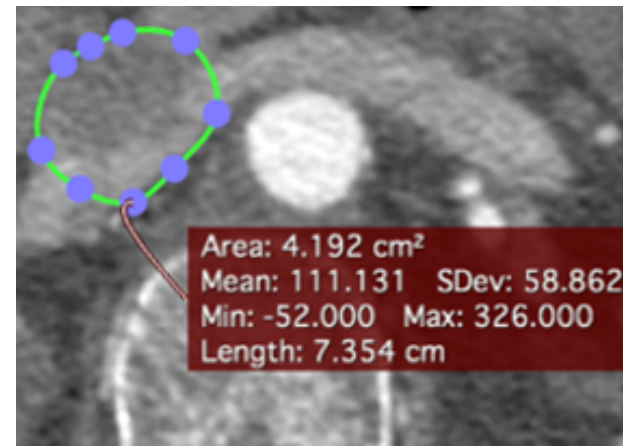
1. Define the diameter of the valve



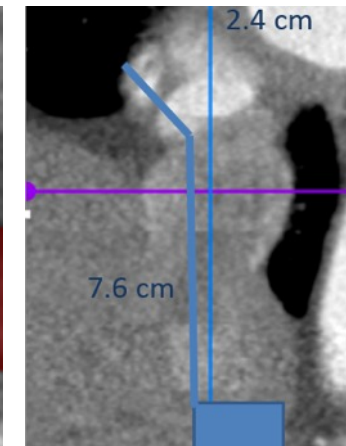
2: Understand the size of the RA, for device accessibility



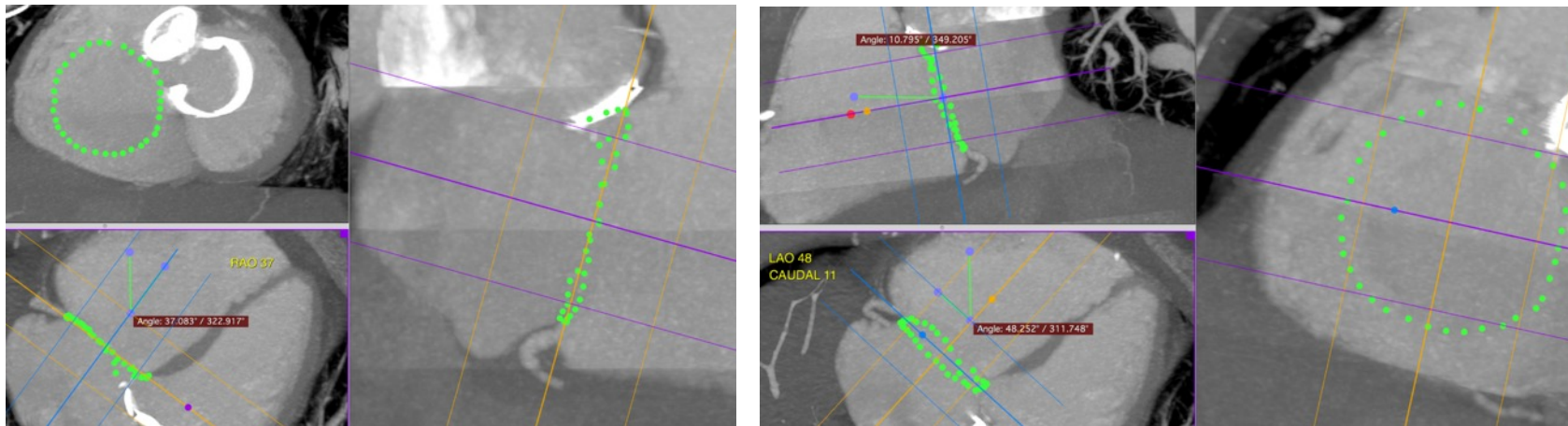
3. Define the Steering angle to achieve target implantation site



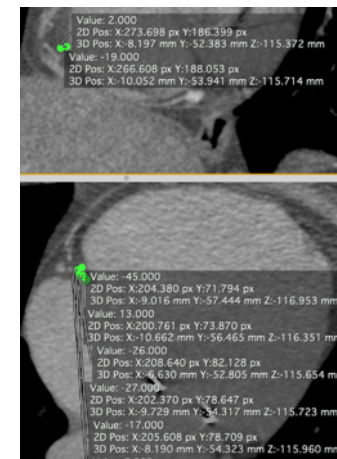
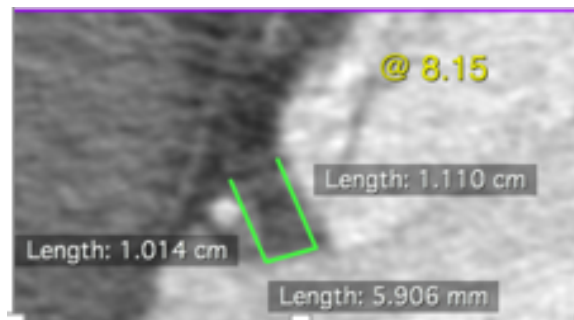
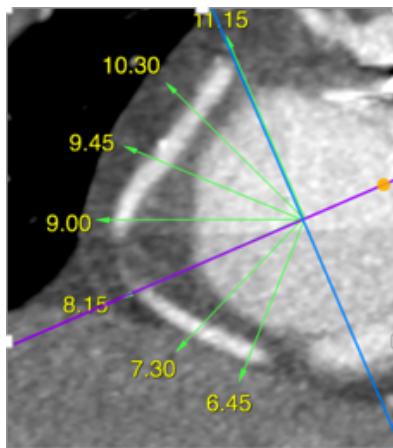
4: Select correct stent size through measurement of IVC, understanding where stent will deploy also



CT review for the TriCinch system: Procedure Planning



1. What fluoro views allow visualisation of the valve (RAO/LAO fluoro views)



2: Understanding where the is space to implant

3: Towards tissue composition understanding: Hounsfield number

What it offers

- Fluid zooming, rotating, panning and scrolling in large series
- A complete set of ROI (Region-Of-Interests) tools are available to measure angles, surfaces, distances, densities, SUV, Cobb angle, volumes, ...
- Extract statistical data on 2D or 3D ROI: min, max, mean, skewness, kurtosis, histogram, s-dev, ...
- Display cross-references lines when several series are opened
- Image fusion for reviewing PET-CT, PET-MR and SPECT-CT, including realtime 2D & 3D SUV calculation
- Customisable hanging protocols
- Create and display key images
- Support Cine Loop for display realtime ultrasounds or angiography images
- Create DICOM compliant screen captures
- Create thick slab in realtime: MIP, Mean, MinIP
- Ultrasound advanced calculations such as VTI, Pressure Gradient, Speed, Spectral, ...
- Support complex calculations such as Time-Intensity Enhancement curves, T2 time calculation, Cardiac
- Ejection Fraction calculation, Growing Region tool
- 4D support for Cardiac-CT & Cardiac-MR



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André Plass



INNOVATION FLASHLIGHT

Thi Dan Linh Nguyen-Kim



**Angio
Consult**

official DACH region partner of

PIE
MEDICAL
IMAGING

3mensio

Mitral Valve

Tristian Slots

Martijn Chatrou

Maaïke Randsdorp

Julian Rieck

Technology

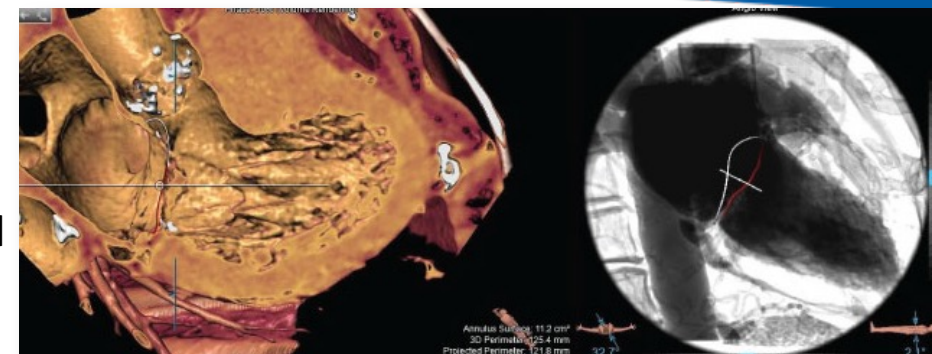
Name and manufacturer: 3mensio Structural Heart, founded in 2003, Pie Medical

Approval status: CE mark, FDA approved in 2009

Technology Background: 3mensio Structural Heart™ Aortic Valve is CT planning and sizing software for trans-aortic valve replacements (TAVR) and is used worldwide. The software has the unique ability to make high complicated medical imaging accessible for a large group of professionals, like interventional cardiologists, radiologists and field specialists of medical device companies. With this extensive experience 3mensio has developed a reproducible workflow for transcatheter mitral valve implantation (TMVI).

Technology Description: Dedicated workflow for pre-procedural planning for TAVR and TMVI. The strength of the software is a reproducible tracing method resulting in a 3-dimensional saddle-shaped mitral annulus with visualization and automatically calculation of important mitral annular parameters, virtual device implementing to avoid LVOT obstruction, automatic calculation of the aortic-mitral angle including septal crossing workflow, virtual angio view with calculation of optimal C-arm angles.

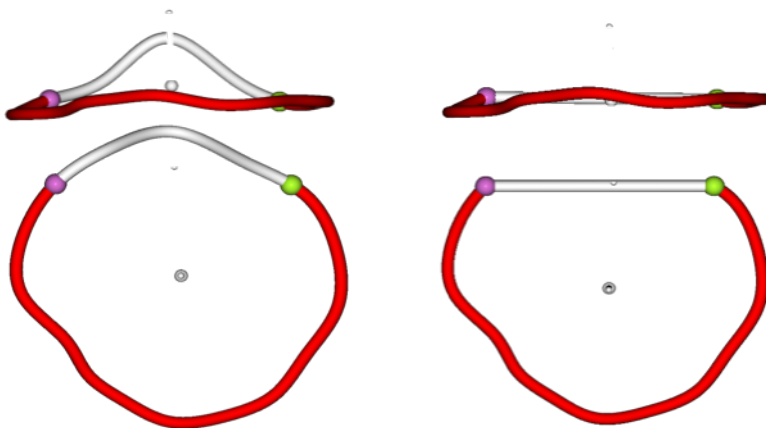
Available Modules: Aortic Root, LAA, Mitral valve, Coronary; Working platforms: Windows, Macintosh



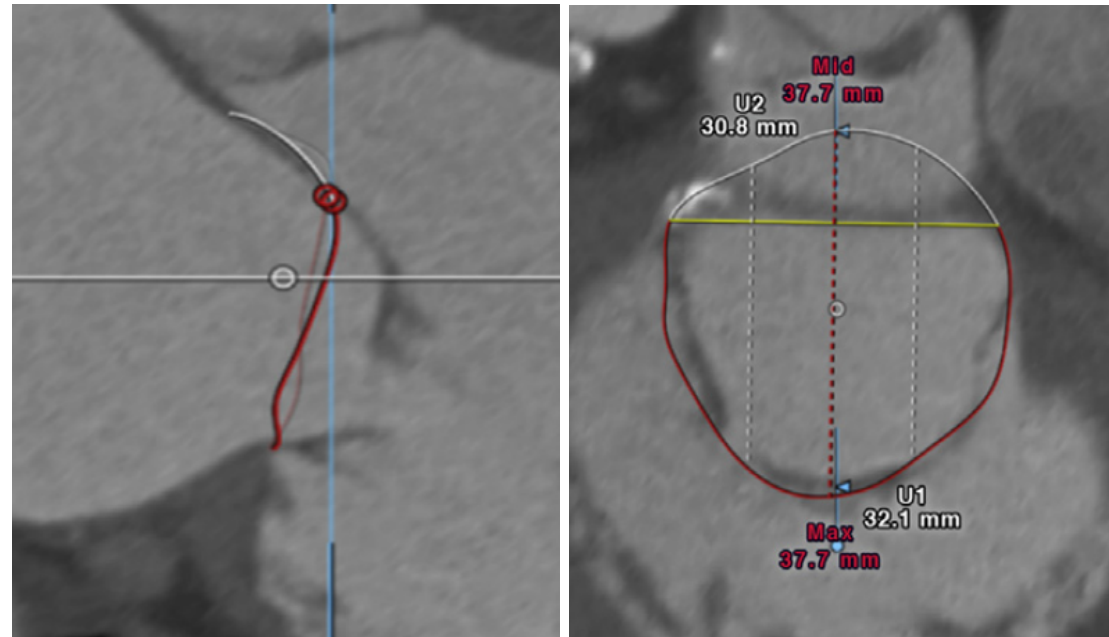
3Mensio Structural Heart / Mitral Valve

Basic

- nonplanar, saddle-shaped 3D structure of mitral annulus
- posterior peak formed by insertion of the posterior mitral valve leaflet
- anterior peak is in part continuous with the aortic annulus
- nadirs are located at the level of fibrous trigones



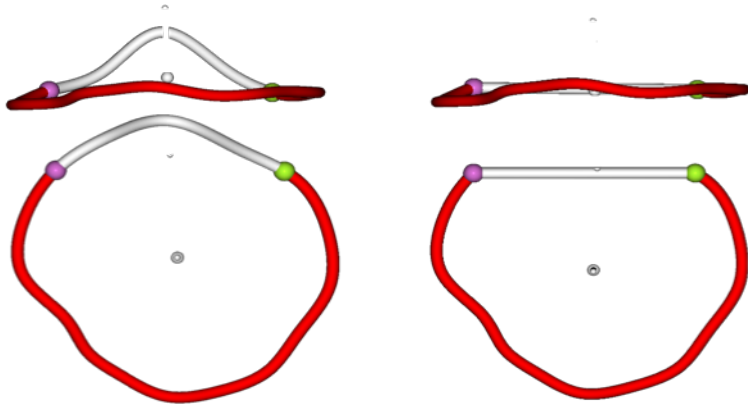
Saddle shaped mitral annulus (*left*) D-shaped mitral annulus (*right*)



3Mensio Structural Heart / Mitral Valve

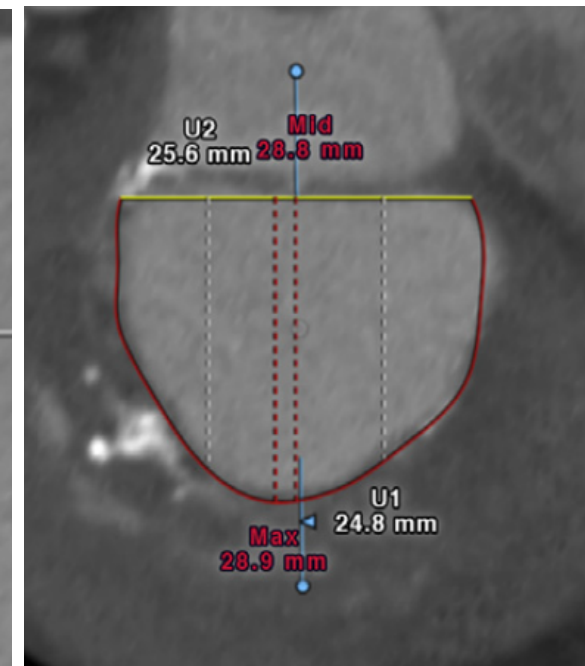
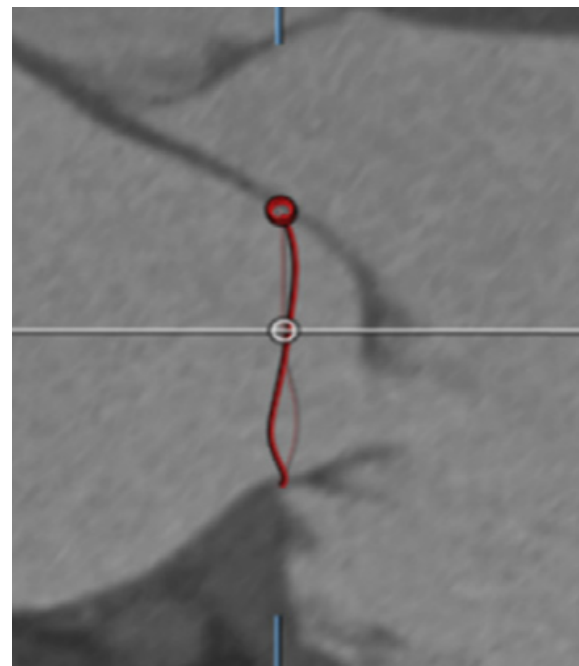
Basic

- concept of D-shaped mitral annulus
- obstruction of the left ventricular outflow tract (LVOT)
- anterior horn must be excluded for sizing



Saddle shaped mitral annulus (*left*)

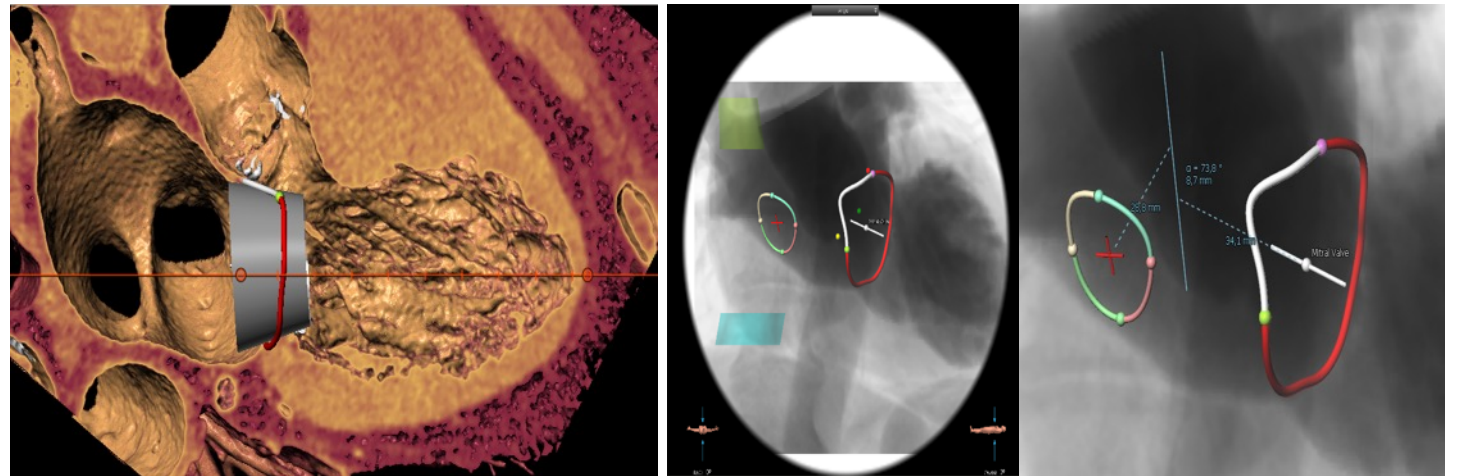
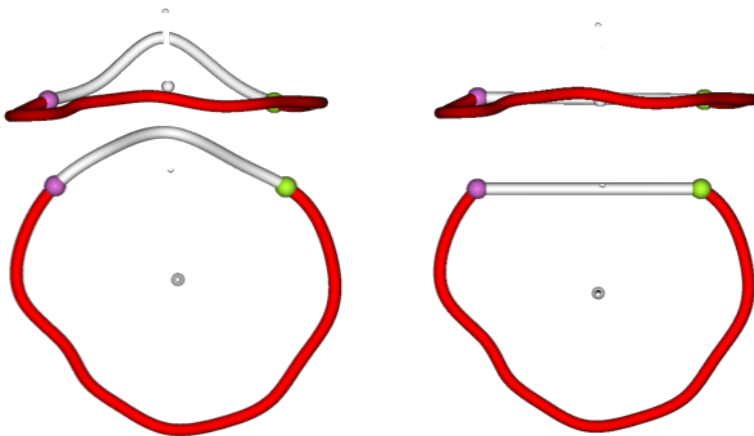
D-shaped mitral annulus (*right*)



3Mensio Structural Heart / Mitral Valve

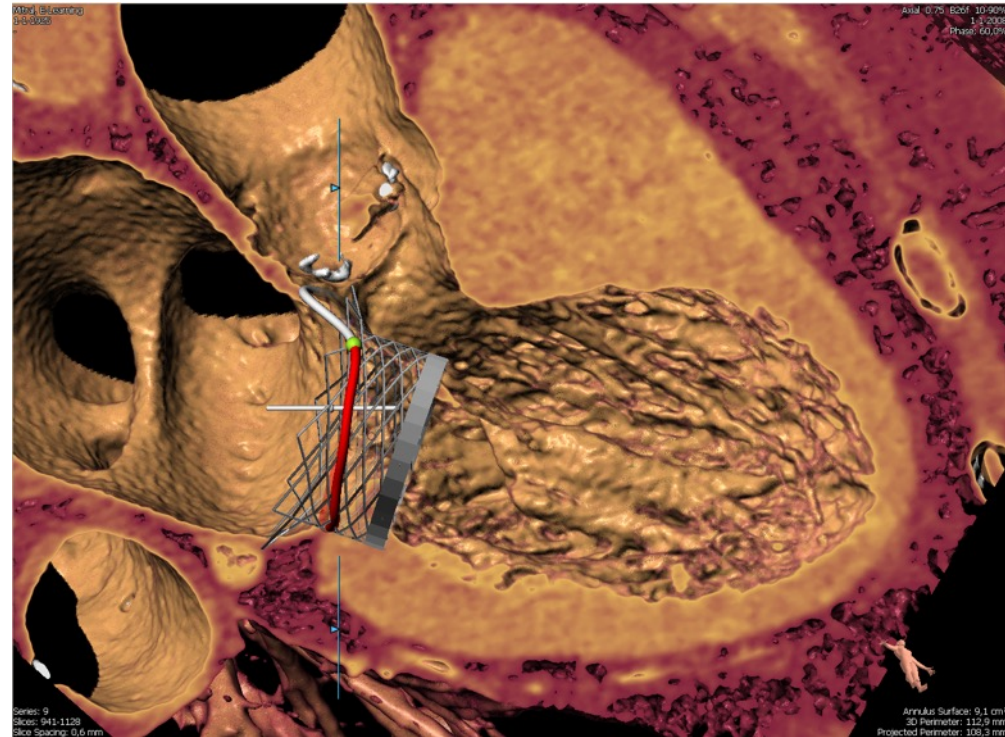
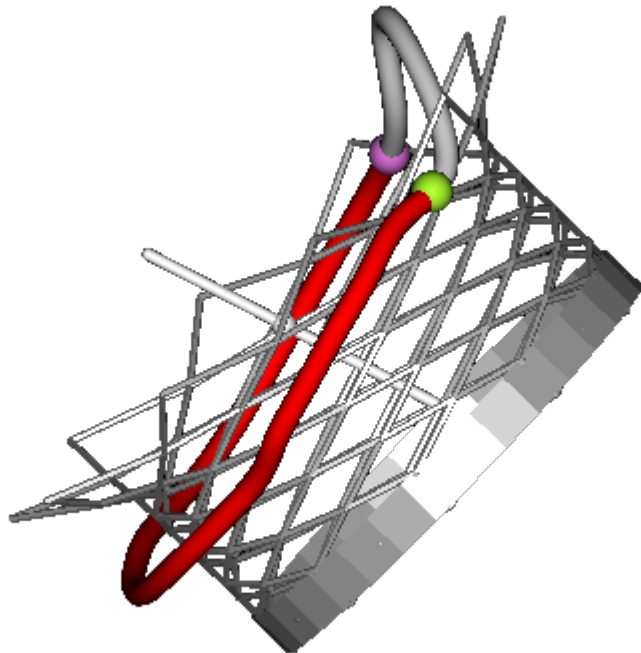
Targets of workshop

- Learn workflow for pre-procedural TMVI planning
- Identify anatomical key structures for mitral valve reconstruction
- Understand saddle shaped structure of mitral valve
- Learning about D-shape model of mitral valve
- Assess possible LVOT obstruction/implementing a virtual device



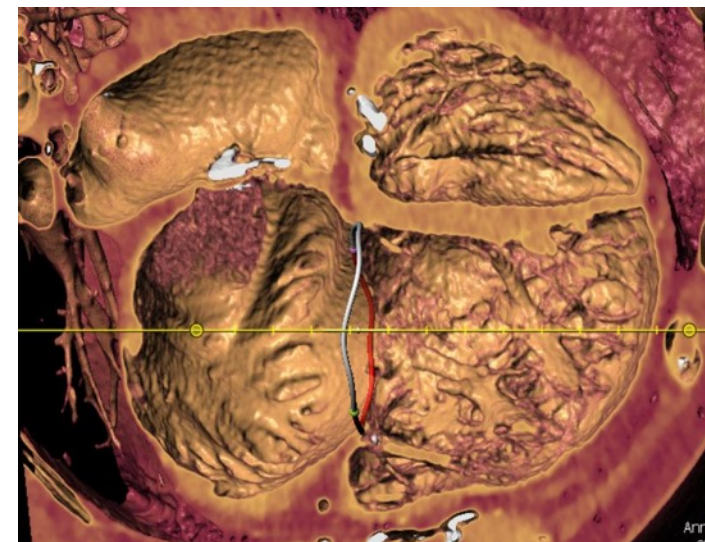
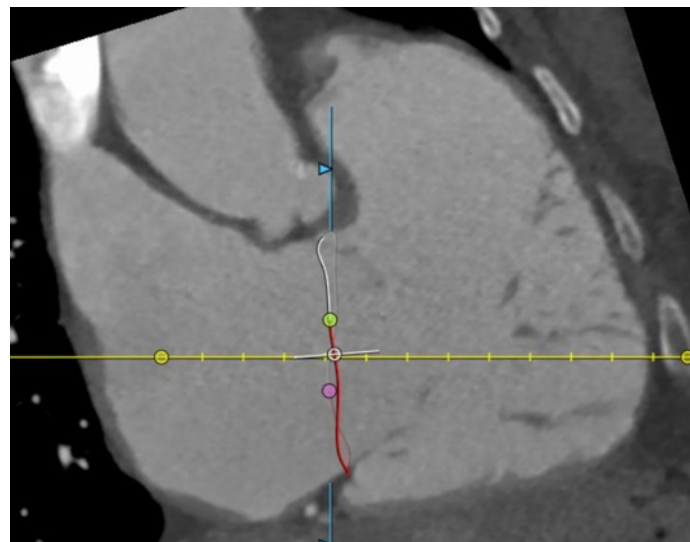
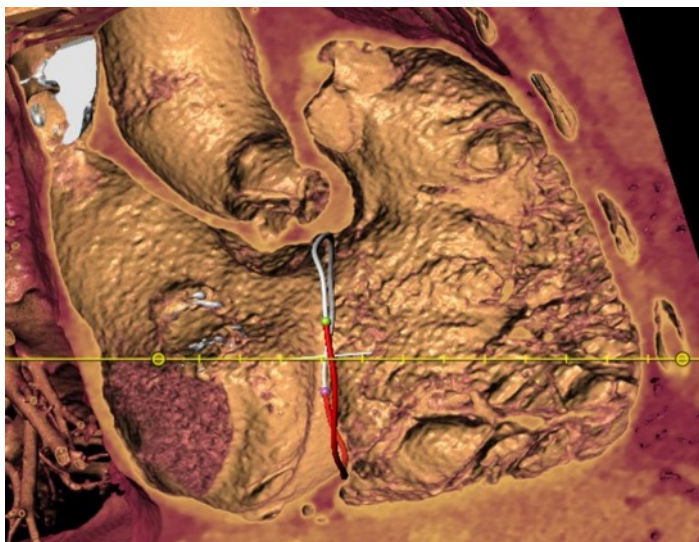
What is new?

- Import of valves (.stl)
- For visualization and positioning of specific heart valves



What is next?

- Non-planar 3D structure of tricuspid annulus
- Access routes via IVC
- Assessment of papillary muscles
- Commissure lengths





INNOVATION FLASHLIGHT



circle
CARDIOVASCULAR
IMAGING

Jonathon Leipsic
Philipp Blanke

Technology

Name and manufacturer: Circle Cardiovascular Imaging Inc. Suite 250, 815 8th Avenue SW. Calgary, AB T2P 3P2. Canada.





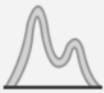










Approval status: In addition to ISO 13485:2003, the company quality system is established and maintained to comply with European Medical Device Directive 93/42/EEC, Australian Therapeutic Goods (Medical Devices) Regulations and US FDA Quality System Regulations, 21 CFR Part 820.

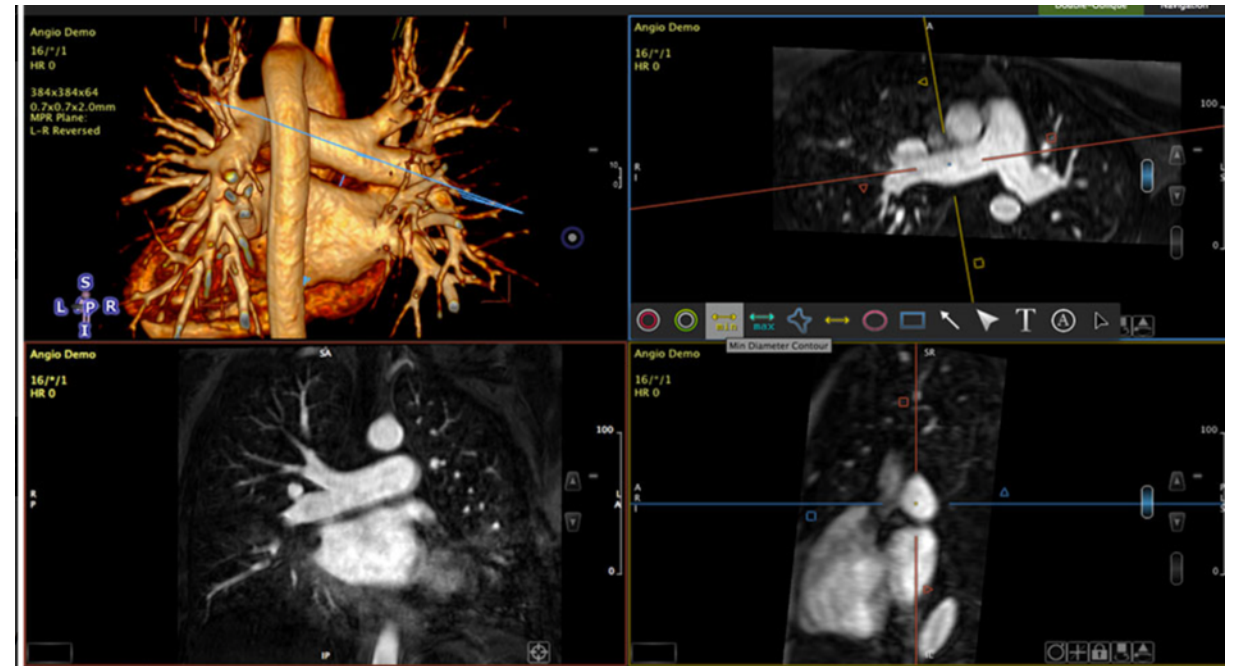
Technology Background: post-processing software that allows for the evaluation and analysis of MRI and CT images. Available for clinical and research use, the stand-alone software provides full DICOM and PACS connectivity.

Technology Description: The suite shall contribute to quality in clinical and research settings, while maximizing patients' achievable benefit by enabling healthcare providers to complete effective and precise analysis. Excellence in cardiovascular imaging and patient care is our highest priority.

Availables Modules: Aortic valve, LAA, Mitral valve, Coronary.

Technology

				
What's New?	Aortic Valve Module	Viewer & Series Composer	Heart Function	Flow
				
Tissue Characterization	Perfusion	T1 Mapping	T2 Mapping	T2* Mapping
				
4D Viewer	Multiplanar Reformation	Vessel	Calcium Scoring	DICOM Support



Circle Structural Heart/Mitral Valve

- Basics: Automated algorithms, an intuitive toolset, a single viewing platform, and easy integration; are valuable additions to any clinical setting.
- What is new: Robust functionality, scientific level accuracy, subject matter input into development, and complete customization

