

Combining multimodality information to optimize planning, guidance and verification of TAVI


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Disclosure Statement of Financial Interest

I, Jacques Koolen DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.



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TAVI in the Catharina Hospital
200 TAVI procedures since June 2008
Corvalve and Sapiens
Femoral/subclavian/transapical approach



Imaging for TAVI

What do we need?

- ▶ Correct diagnosis
- ▶ Optimal treatment options
- ▶ Risk assessment
- ▶ Optimal procedure guidance
- ▶ Follow-up

What do we have, how to use?


- ▶ TTE: severity stenosis , LV function, follow-up
- ▶ (3D-)TEE: Choice of valve, periprocedural guidance
- ▶ Angiography: risk stratification, choice of approach, choice of valve
- ▶ CT: peripheral vasculature, periprocedural guidance

Why is correct (exact) positioning mandatory?


Too low:

- ▶ Aortic incompetence
- ▶ Interference with mitral valve

Too high:

- ▶ Unstable
 - ▶ Interference with coronary arteries
- 

Why is correct positioning difficult?

1. Visualization
 2. Calcifications
 3. Self-expanding system (Corevalve)
 4. Combination of 2+3
- 

Planning

CT Data evaluation: diagnosis and treatment options / sizing of aortic root

Planning

CT Data evaluation: slice view is not enough!

- ▶ Aortic root is a 3 dimensional structure
- ▶ Device choice should be considered in 3 dimensions
- ▶ Does not provide information on optimal view to be used during intervention

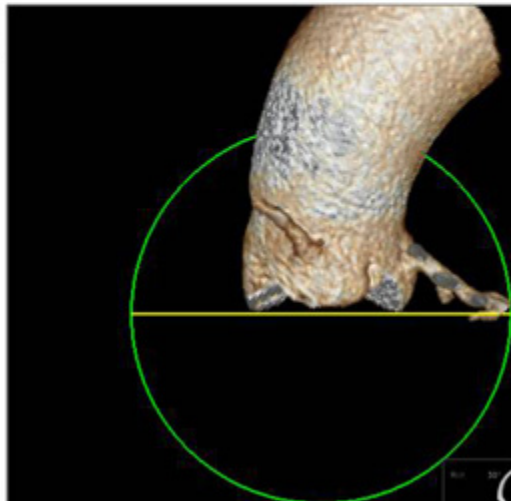
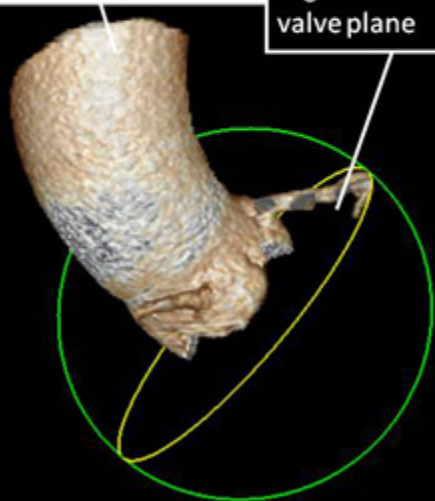
Planning

HeartNavigator: CT based optimal view planning

Automatic
Segmentation of
Aortic root

Automatic
segmentation of
valve plane

Optimal X-ray view in line
with valve plane



Planning

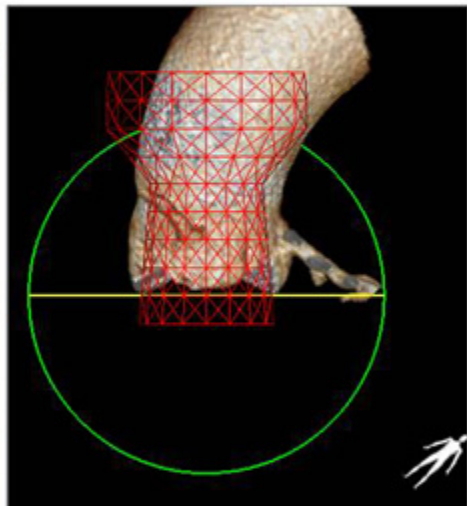
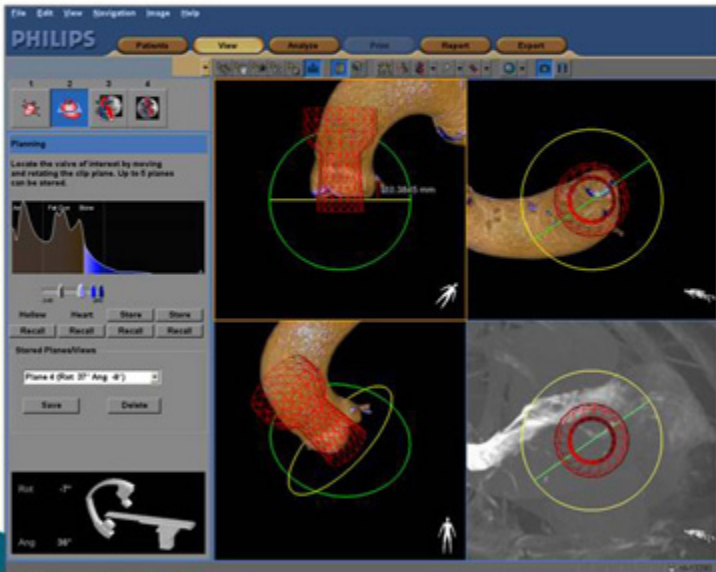
HeartNavigator: CT based measurements

The screenshot displays the Philips HeartNavigator software interface, which is used for CT-based measurements in cardiac planning. The interface is organized into several panels:

- Top Panel:** Includes the Philips logo and navigation tabs for Patients, View, Analyze, Print, Report, and Export. Below these are icons for various tools and functions.
- Left Panel:**
 - Planning:** A section with instructions: "Locate the valve of interest by moving and rotating the clip plane. Up to 5 planes can be stored." Below this is a graph showing a cross-sectional profile of the heart with a blue shaded area under the curve.
 - Buttons:** A row of buttons labeled "Hollow", "Heart", "Store", and "Store". Below that is another row of buttons labeled "Recall", "Recall", "Recall", and "Recall".
 - Stored Planes/Views:** A dropdown menu currently showing "Plane 1 (Rot 28° Ang -17°)". Below it are "Save" and "Delete" buttons.
 - Orientation:** A 3D schematic of the heart with "Rot 28°" and "Ang -17°" labels.
- Main Display Area:** A 2x2 grid of images:
 - Top-Left:** A 3D reconstruction of the heart with a green clip plane. A measurement of 23.956 mm is displayed.
 - Top-Right:** A 3D reconstruction of the heart with a green clip plane. A measurement of 22.423 mm is displayed.
 - Bottom-Left:** A 3D reconstruction of the heart with a green clip plane. A measurement of 23.050 mm is displayed.
 - Bottom-Right:** A grayscale CT scan of the heart with a green clip plane overlaid.

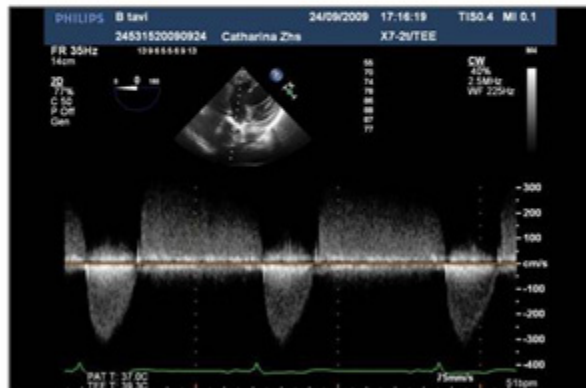
Planning

HeartNavigator: device planning



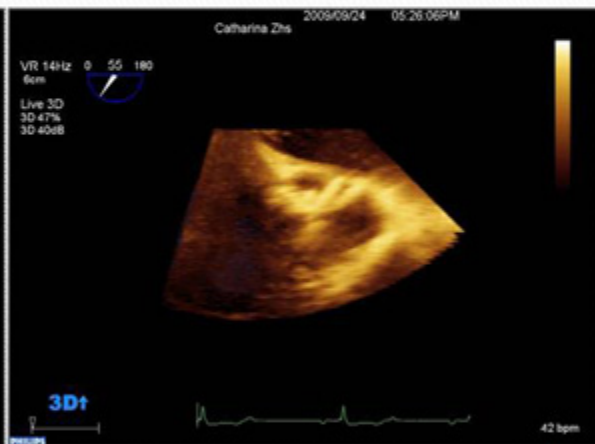
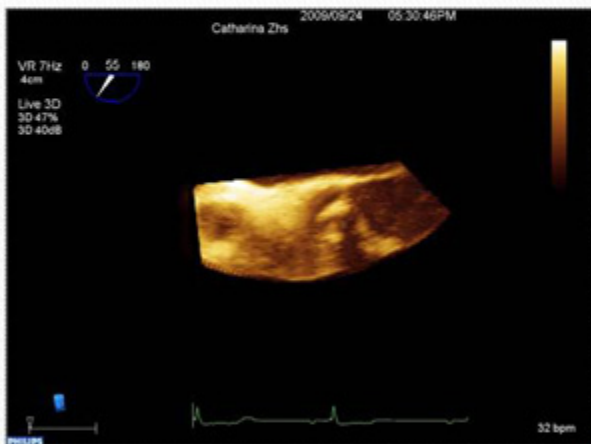
Planning

TEE: diagnosis and risk assessment



Planning

3D-TEE: diagnosis aortic valve

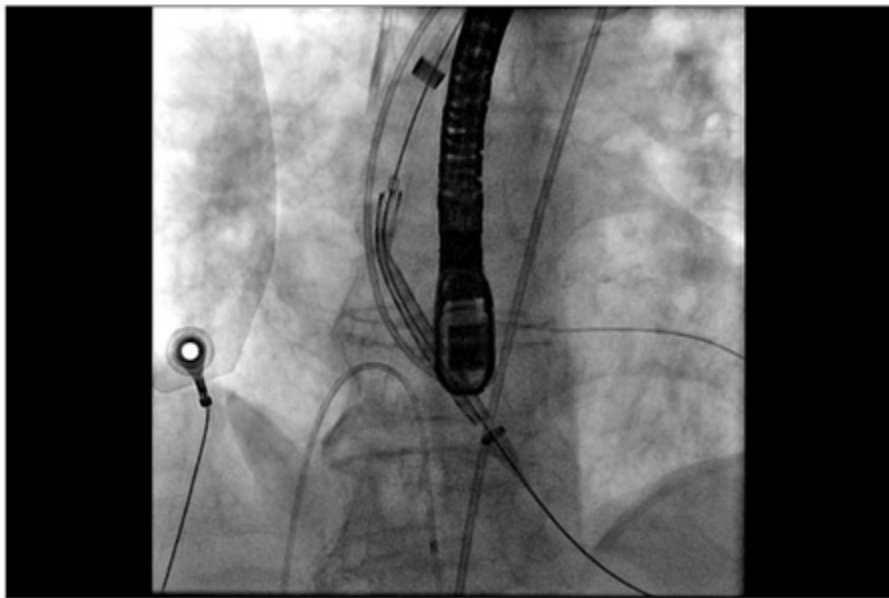


VR 7Hz

VR 14Hz

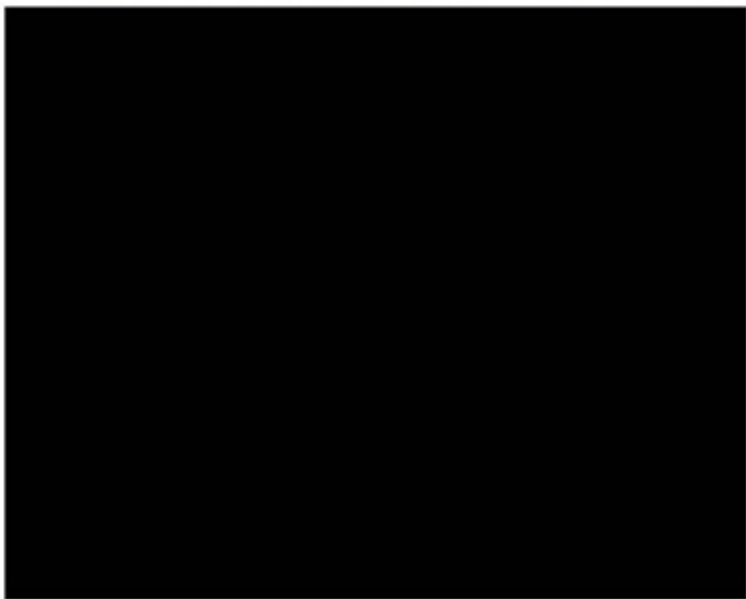
Guidance

Angio: positioning of CoreValve



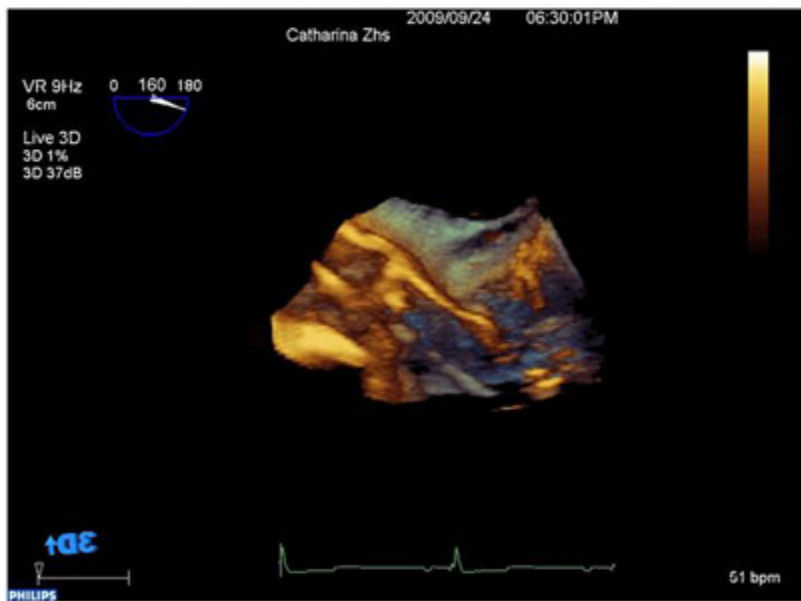
Guidance

HeartNavigator: CT overlay on live fluoro



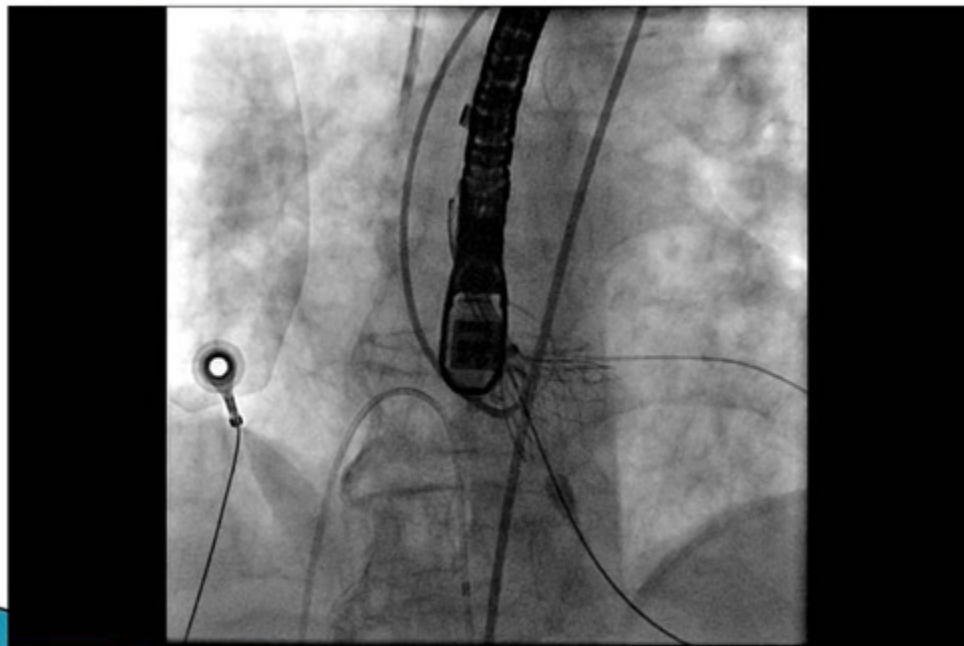
Guidance

3D-TEE: position CoreValve and monitoring



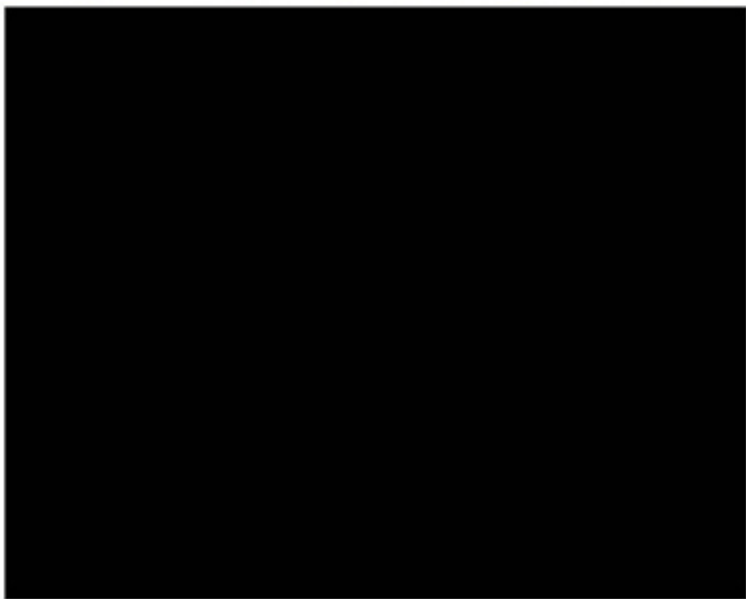
Guidance

Angio: partial release of CoreValve



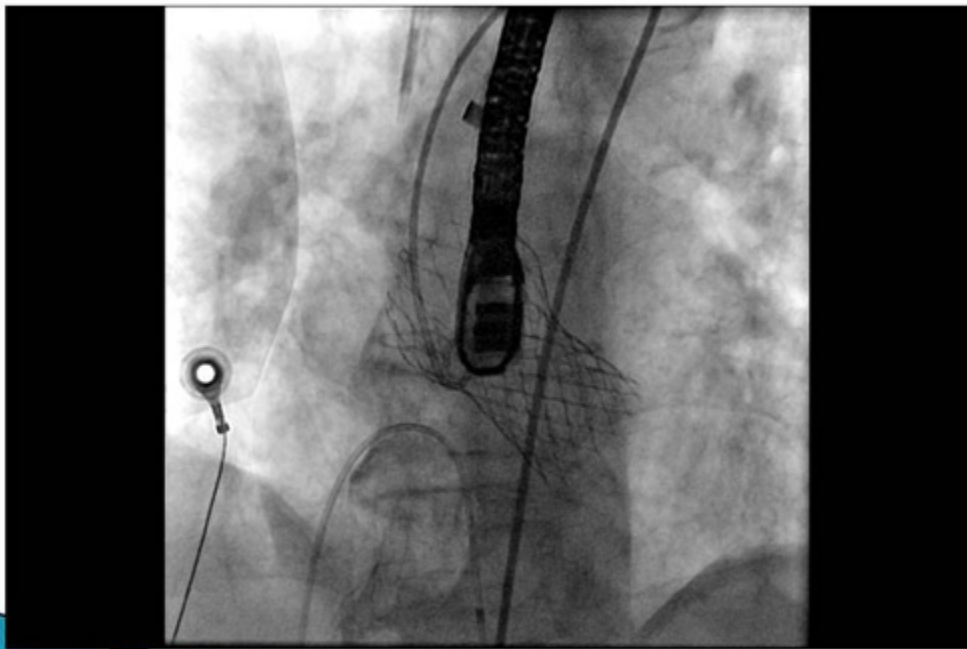
Guidance

HeartNavigator: partly deployed valve



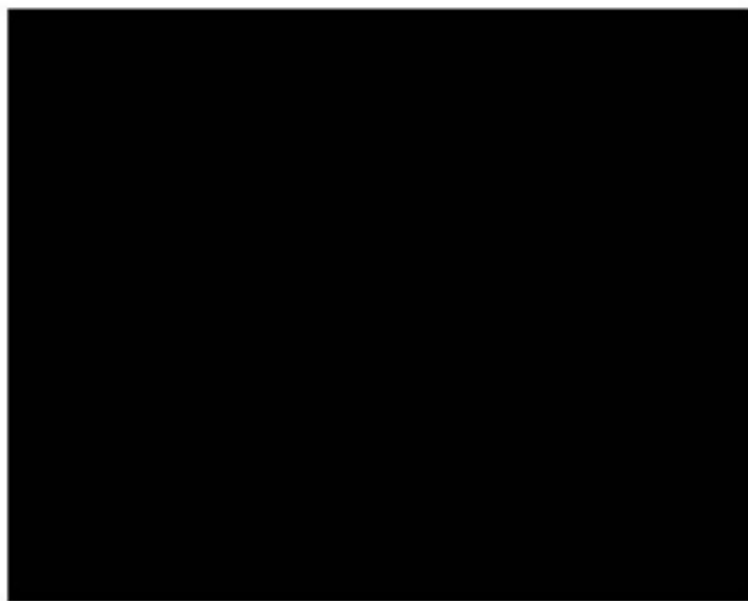
Verification

Angio: deployment and regurgitation



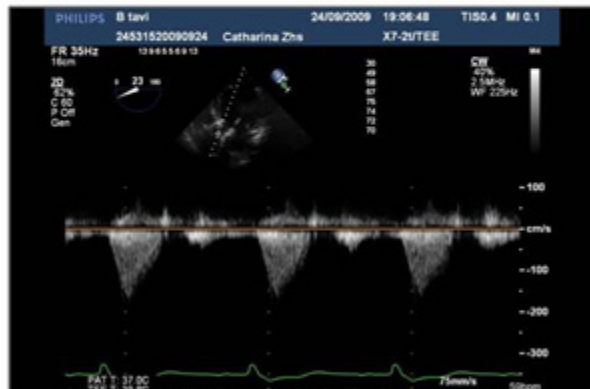
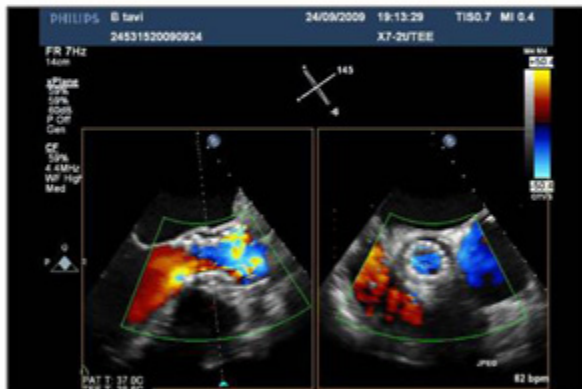
Verification

*HeartNavigator: deployed valve, regurgitation,
position*



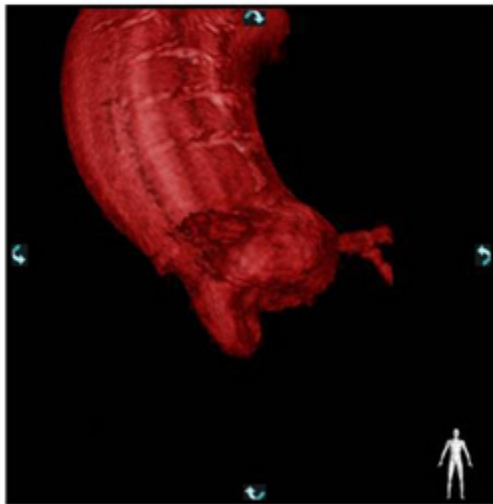
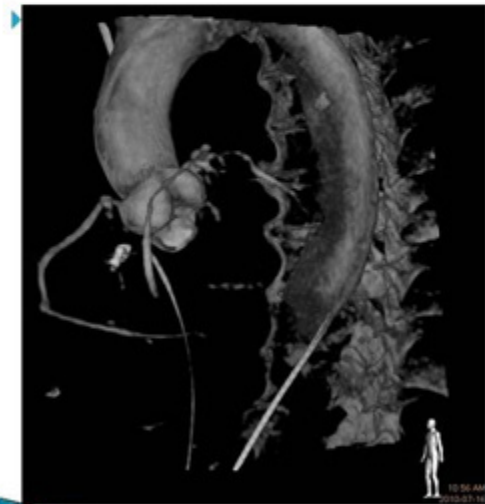
Verification

3D TEE: MV and regurgitation



Outlook

Avoid need for pre-procedural CT



Conclusion

Multimodality information for TAVI

- Images and data integration are needed for:
 - optimizing the pre-peri-post procedural guidance
 - risk stratification
 - surveillance of procedure
 - follow-up

- What are the preconditions
 - an experienced multidisciplinary team
 - well equipped sterile cathlab → hybrid room