



Centre for
Heart Valve Innovation
St. Paul's Hospital, Vancouver



CT for Transcatheter Mitral Valve Interventions

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St. Paul's Hospital & University of British Columbia

Disclosures

Consultant to

Edwards Lifesciences Inc.

Neovasc Inc.

Circle Imaging

Tendyne Holdings

SPH Cardiac CT Core Lab, providing services to

Edwards Lifesciences Inc.

Neovasc Inc.

Tendyne Holdings Inc.

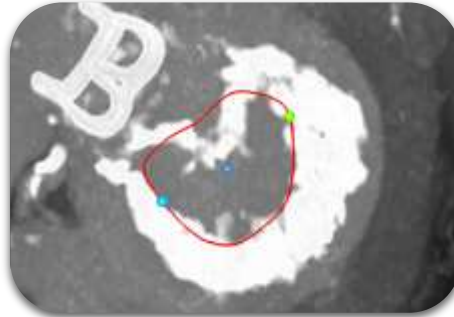


CT Assessment for Mitral Valve Procedures

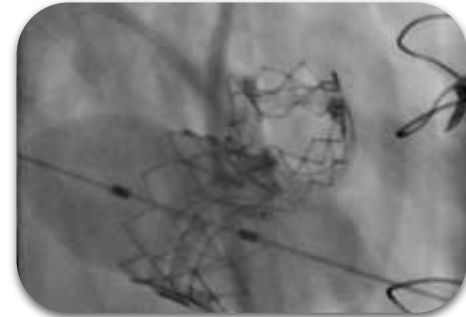
Spectrum of Implantation/Replacement



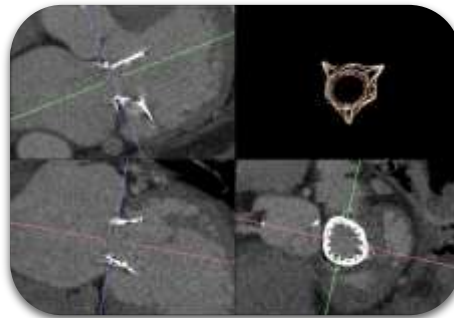
TMVI



THV in calcific
MVD



ViV

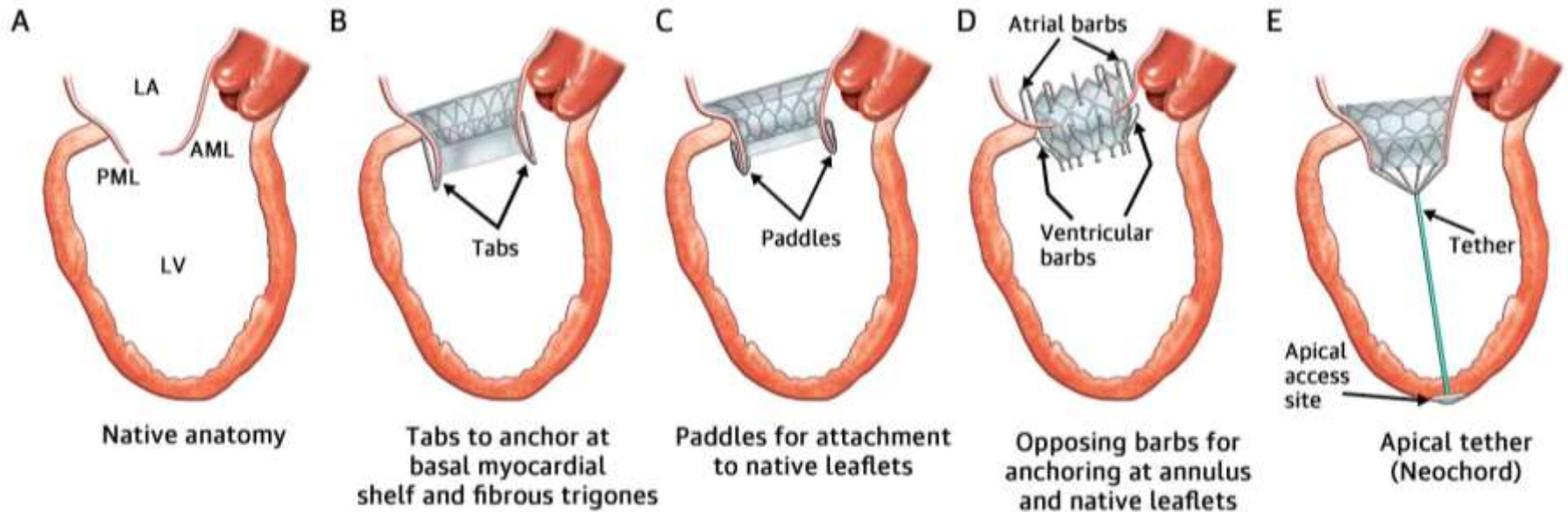


ViR



Transcatheter Mitral Valve Implantation (TMVI/TMVR)

Different devices – Different requirements!



Blanke et al. JACC Imaging 2015

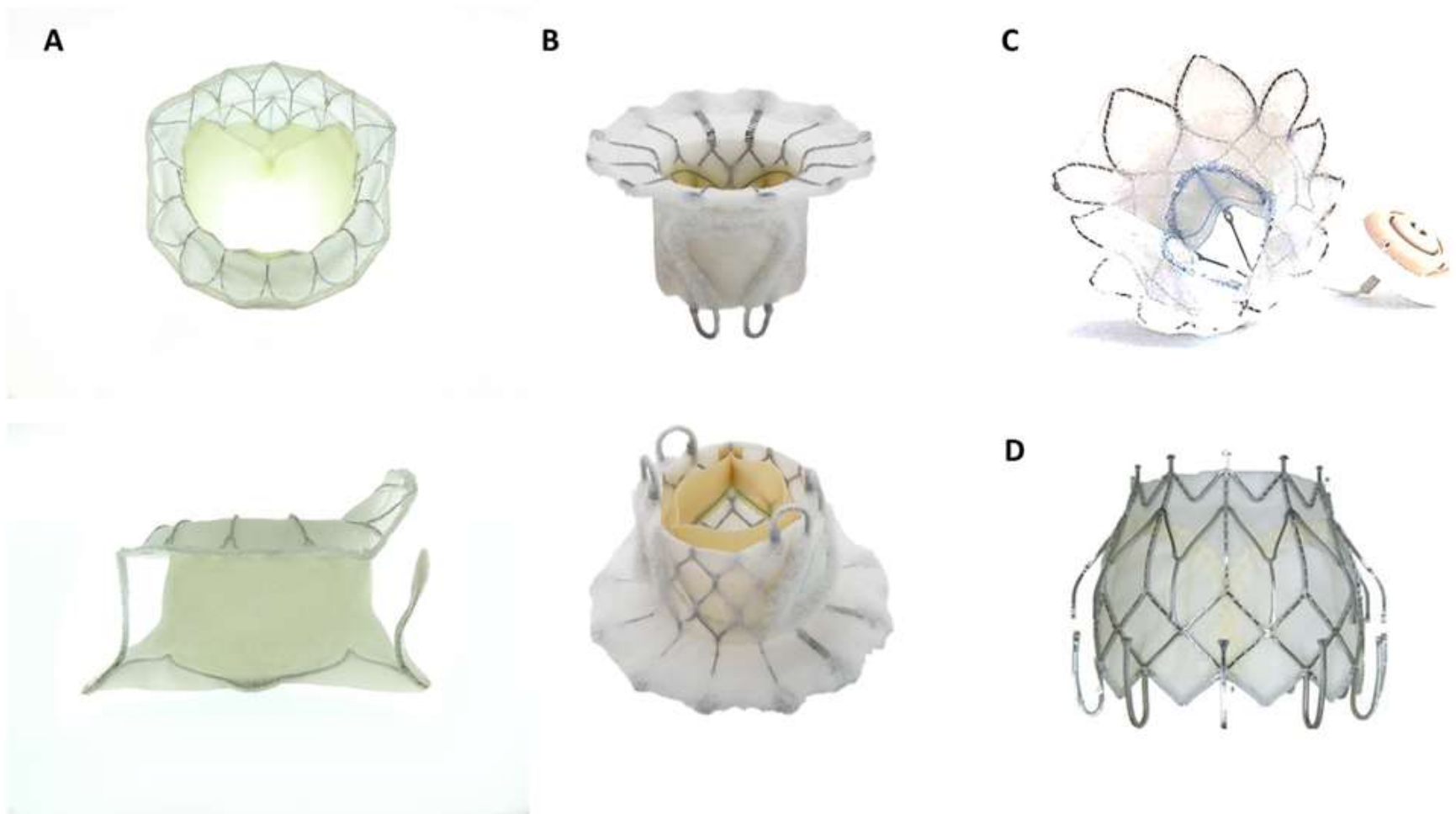


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Transcatheter Mitral Valve Implantation (TMVI/TMVR)

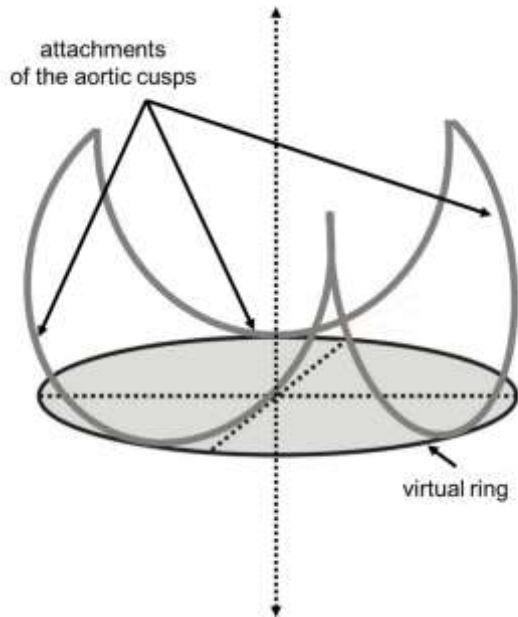
Different devices – Different requirements!



TAVR & TMVI

Role of Computed Tomography

1. Device sizing (annulus/landing zone)
2. Adjacent anatomy (coronary artery orifices)
3. Access evaluation
4. Prediction of fluoroscopy angulation



2008/2009

First reports of CT for TAVR planning

2014

First TMVI in Vancouver *with CT planning*

2002

First TAVR by Alain Cribier in France

2006

Regulatory approval in Europe;
Start of PARTNER

2011

Regulatory approval in the US

2014

PARTNER II S3 Trial *CT mandated*

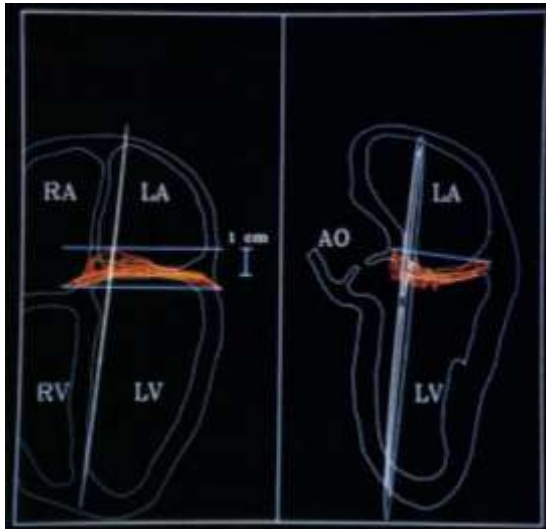


1. Mitral Annular Geometry

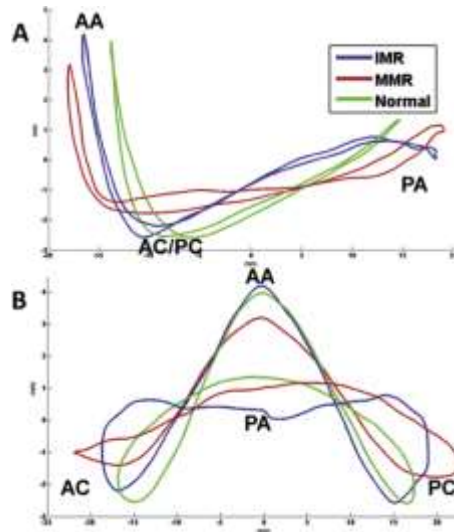


1. Mitral Annular Geometry

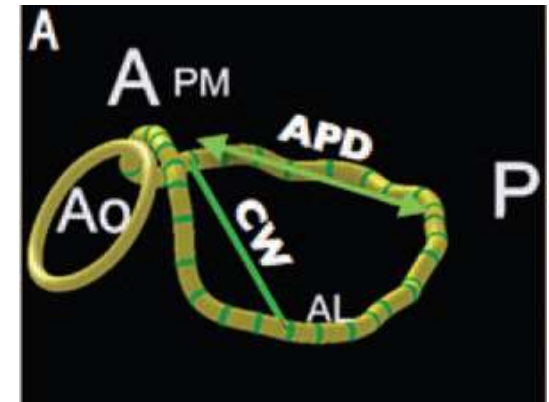
Mitral annulus: saddle-shaped 3-dimensional configuration



Levine et al. *Circulation* 1989



Jassar et al. *ATS* 2014

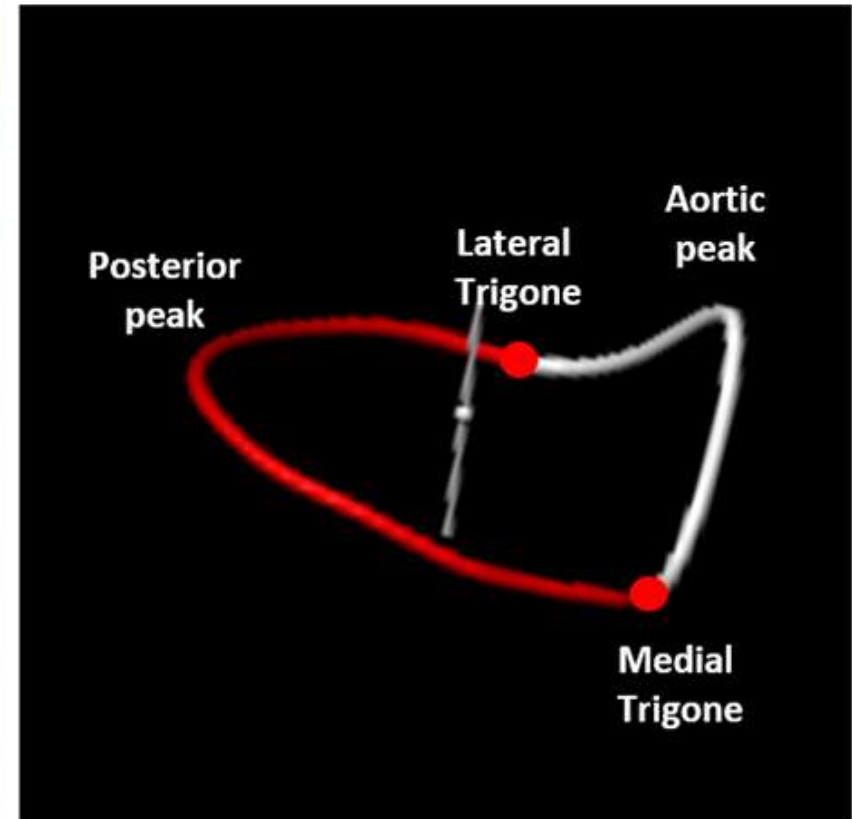
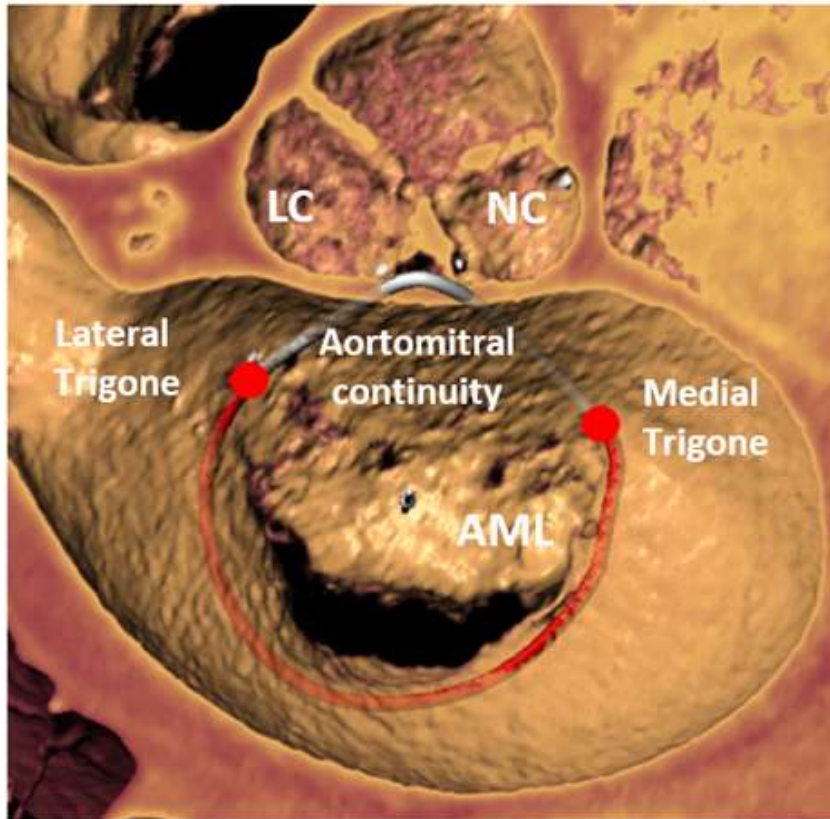


Lee et al. *Circulation* 2013



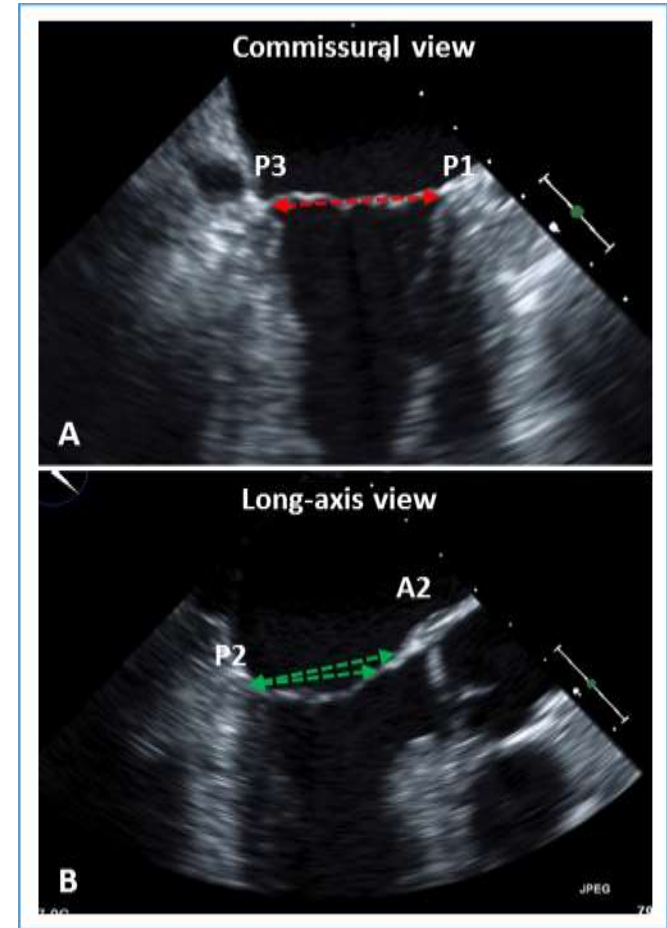
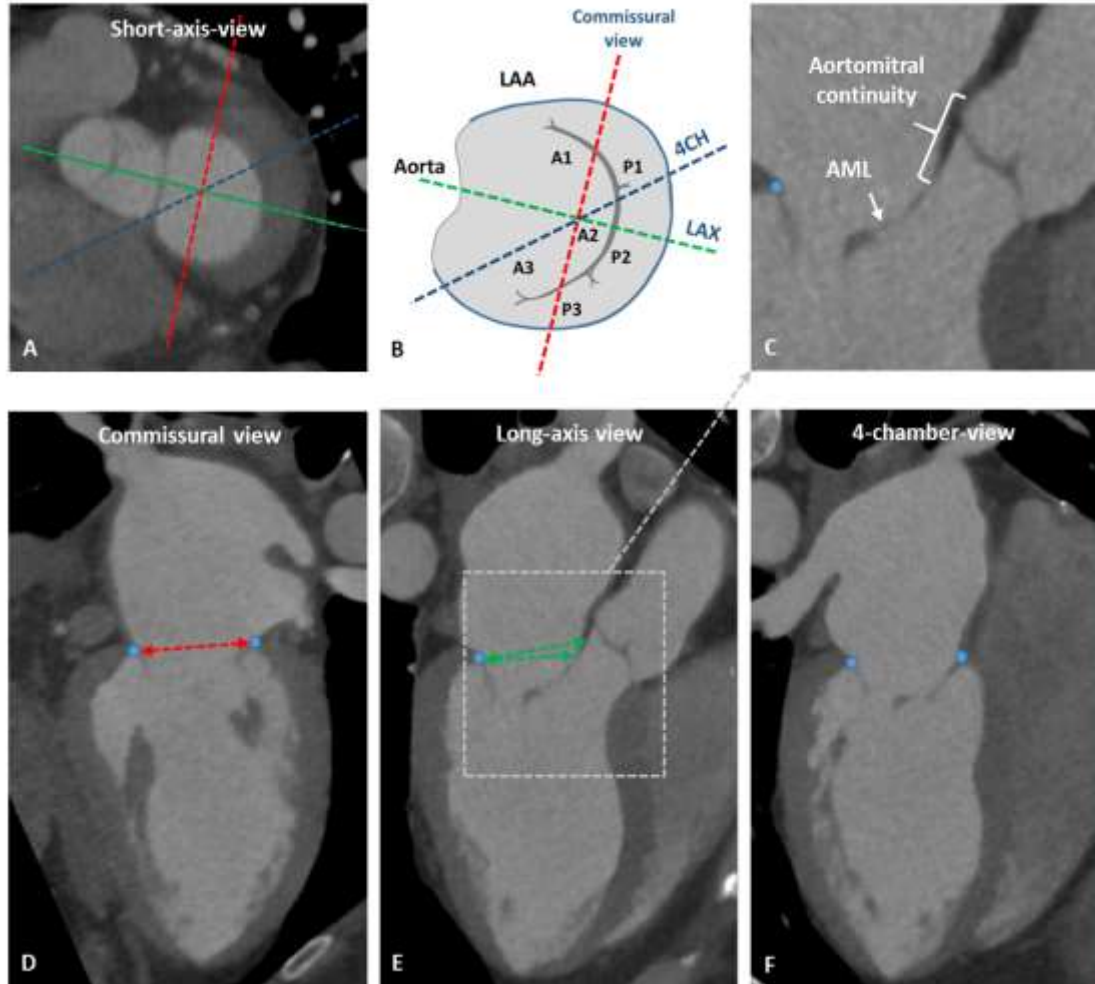
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Mitral annulus: saddle-shaped 3-dimensional configuration



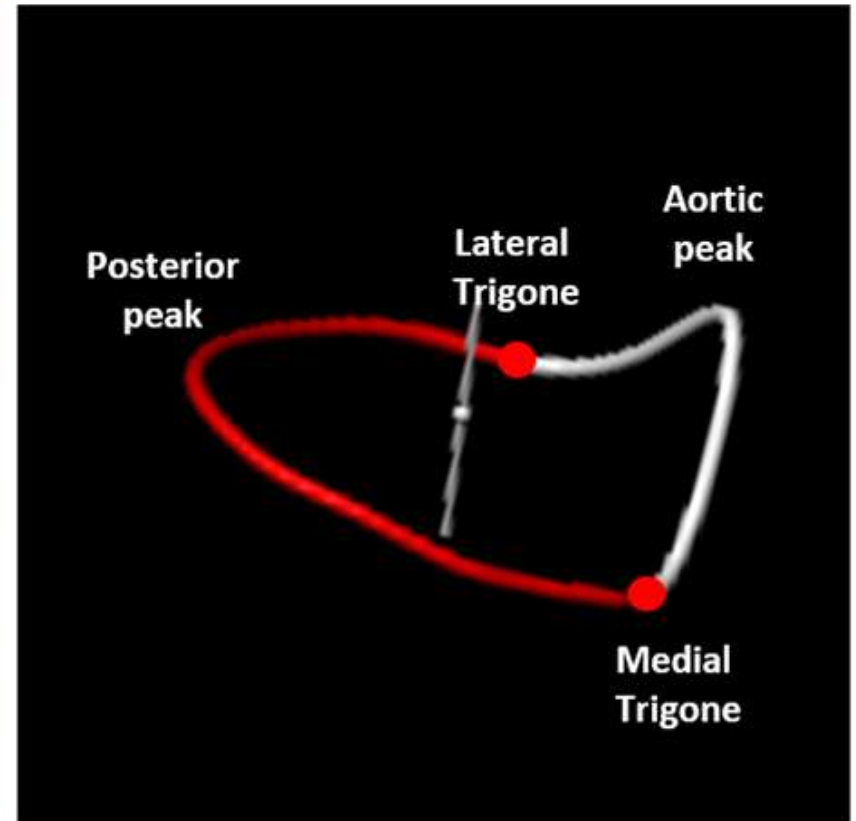
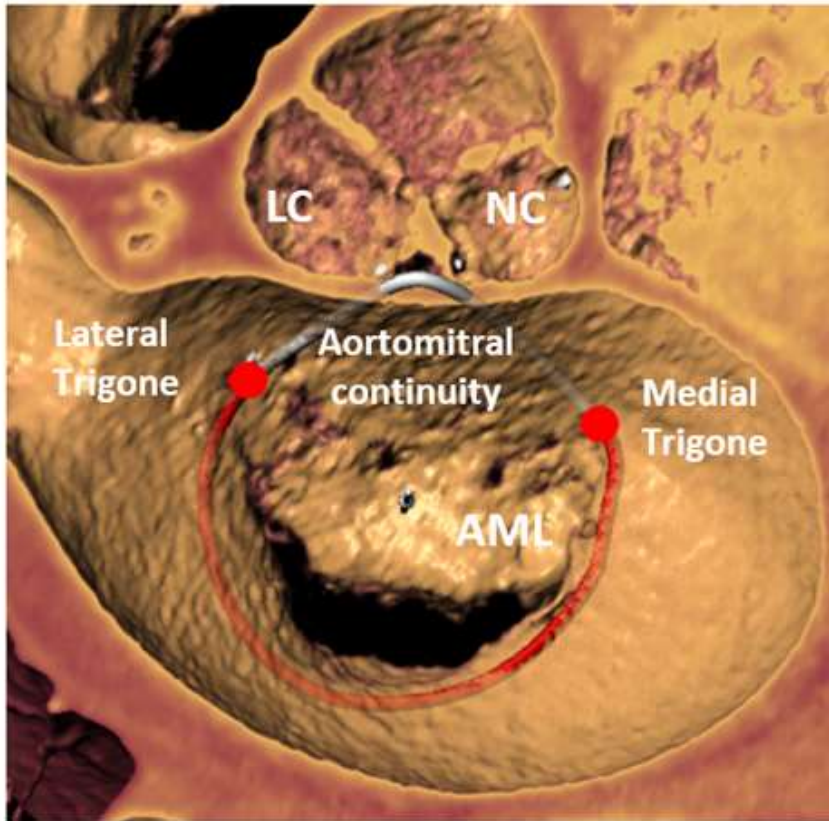
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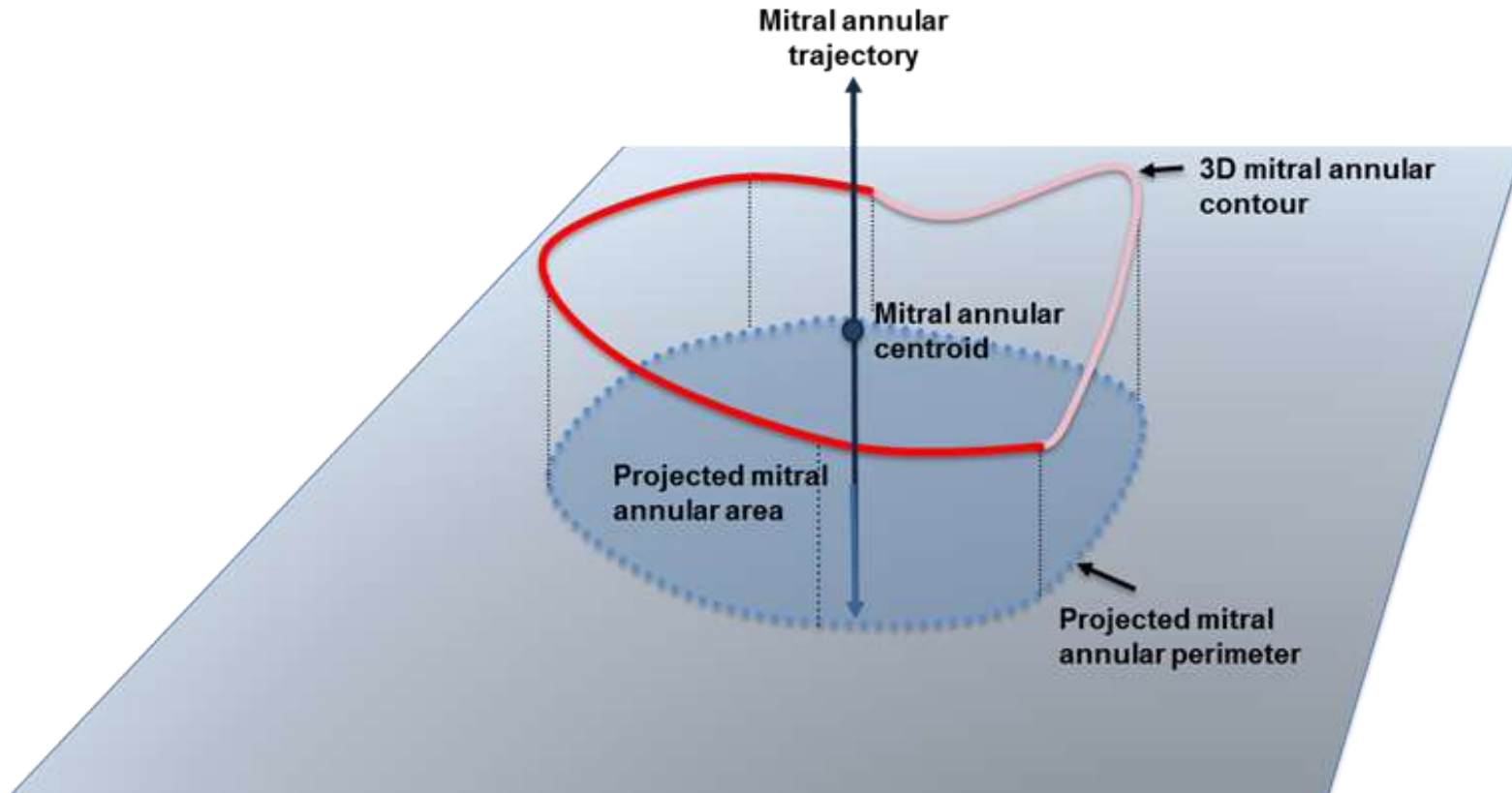
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Mitral annulus: saddle-shaped 3-dimensional configuration



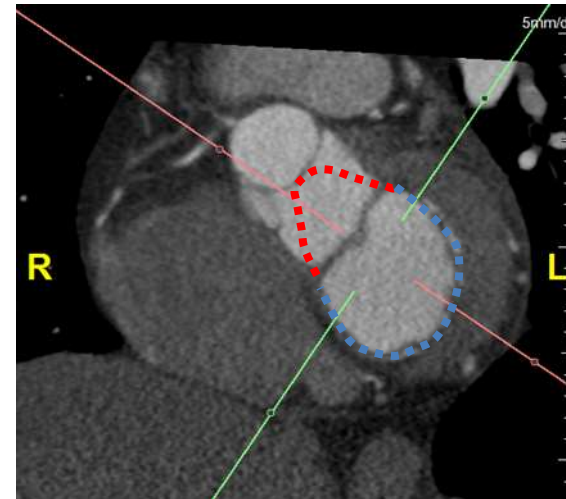
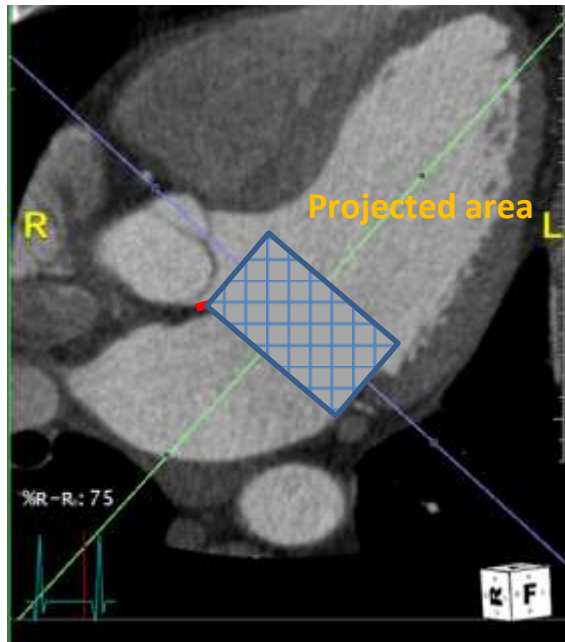
1. Mitral Annular Geometry

Mitral annulus: saddle-shaped 3-dimensional configuration



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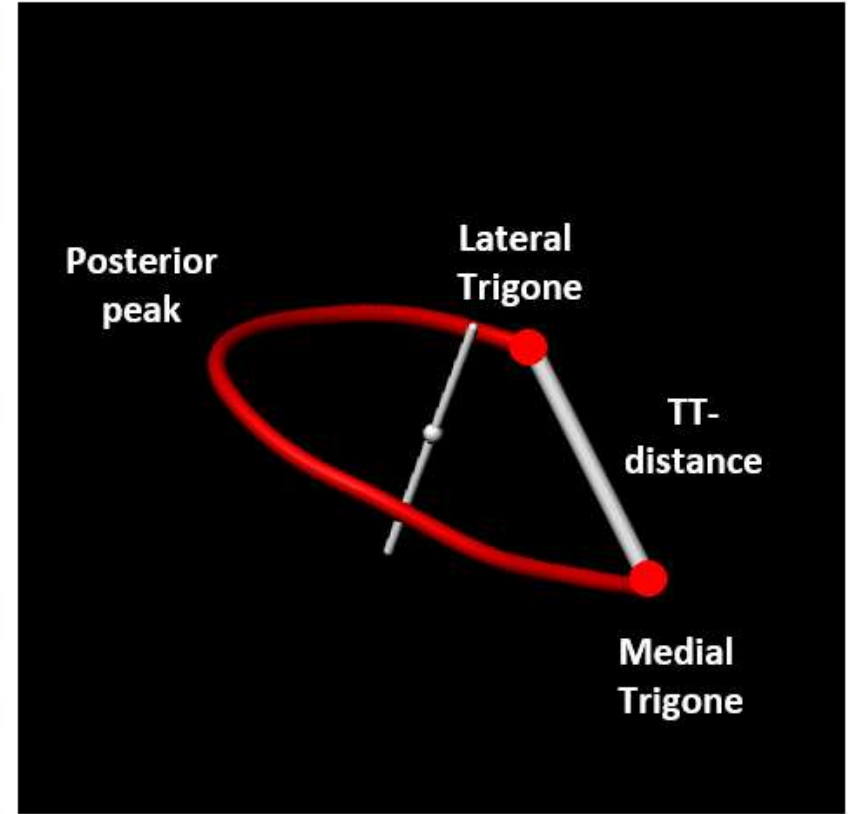
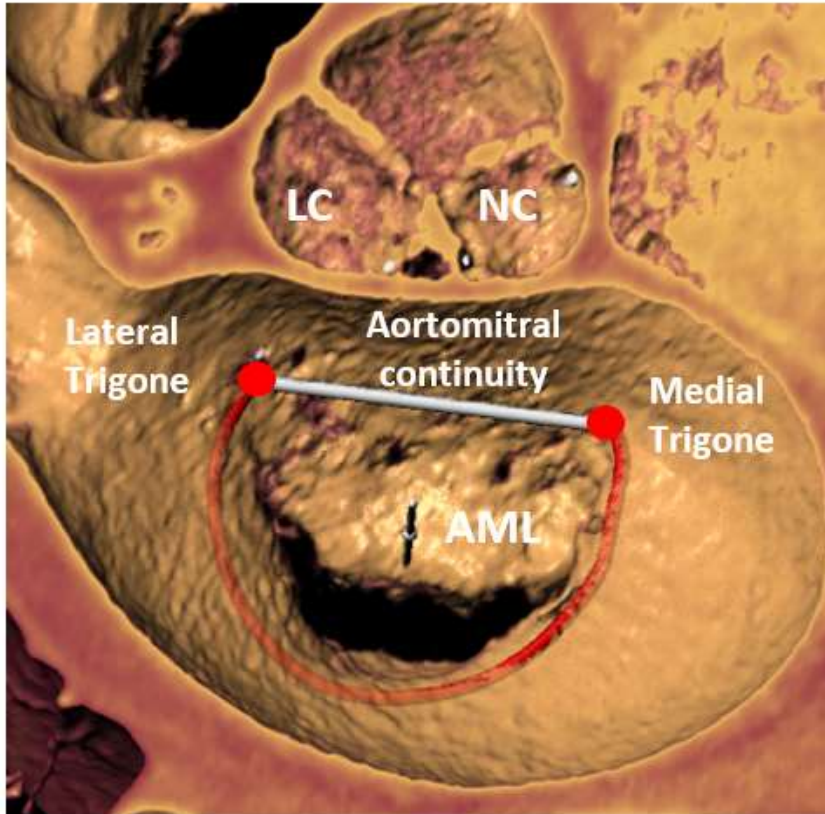
Mitral annulus: saddle-shaped 3-dimensional configuration



1. Mitral Annular Geometry

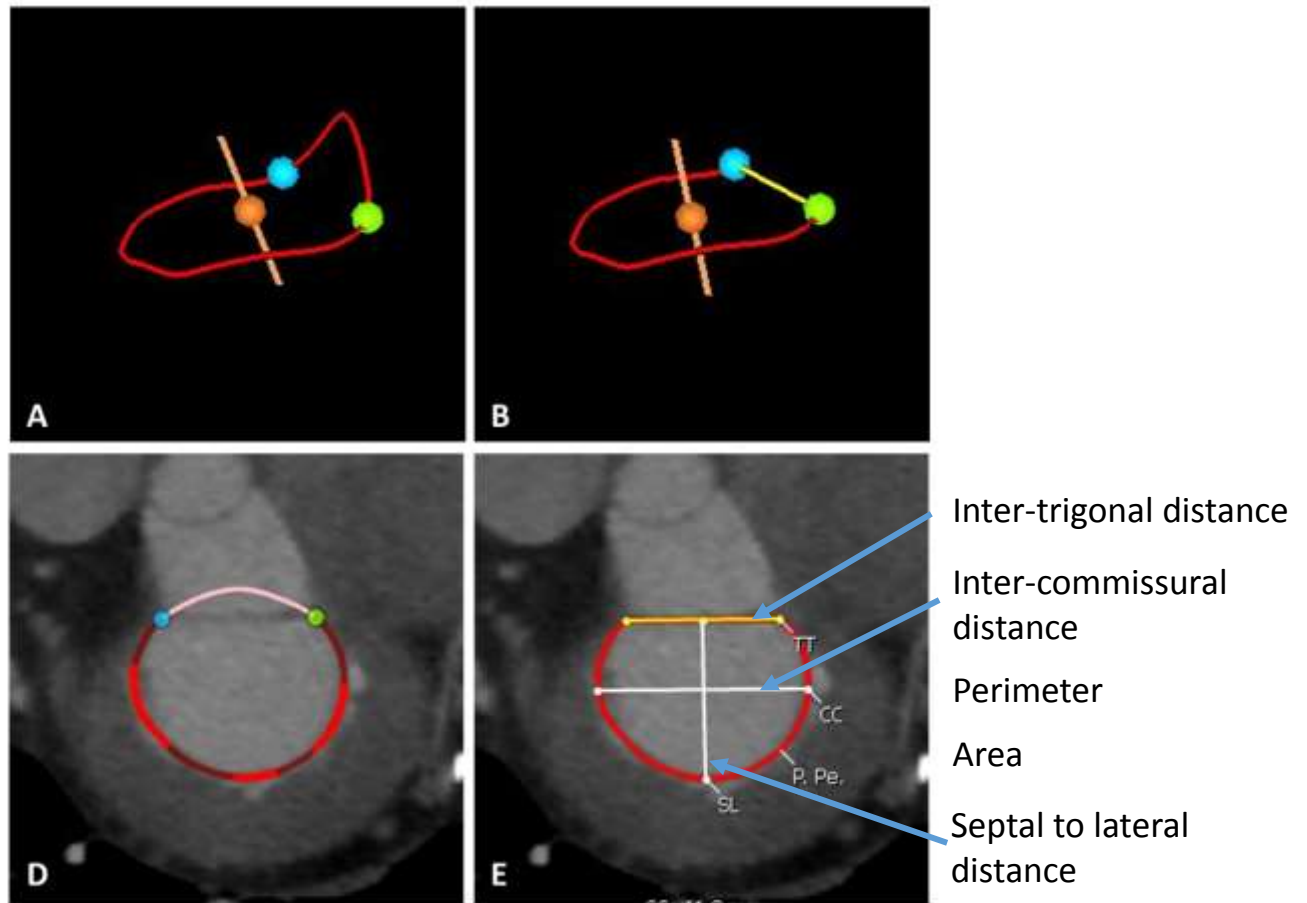
D-shaped annulus

Trigone-to-trigone distance



1. Mitral Annular Geometry

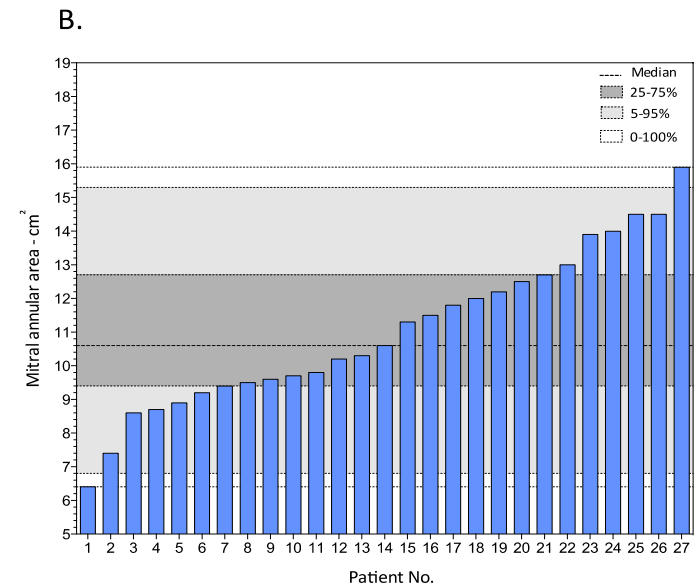
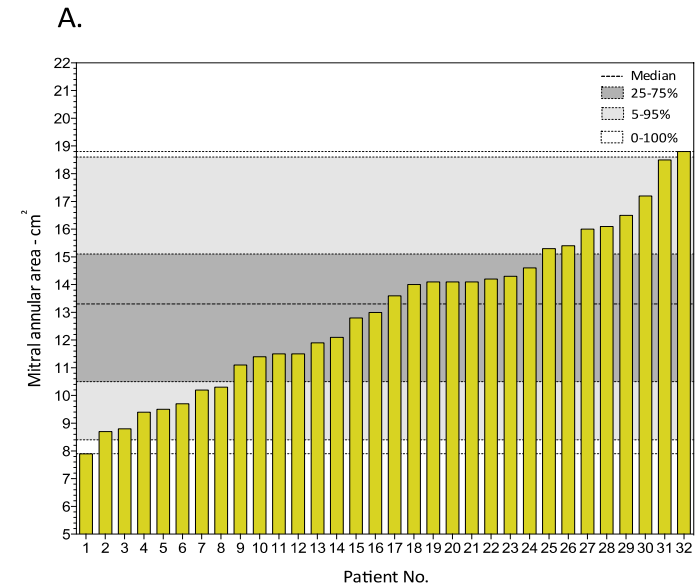
Annular segmentation



1. Mitral Annular Geometry

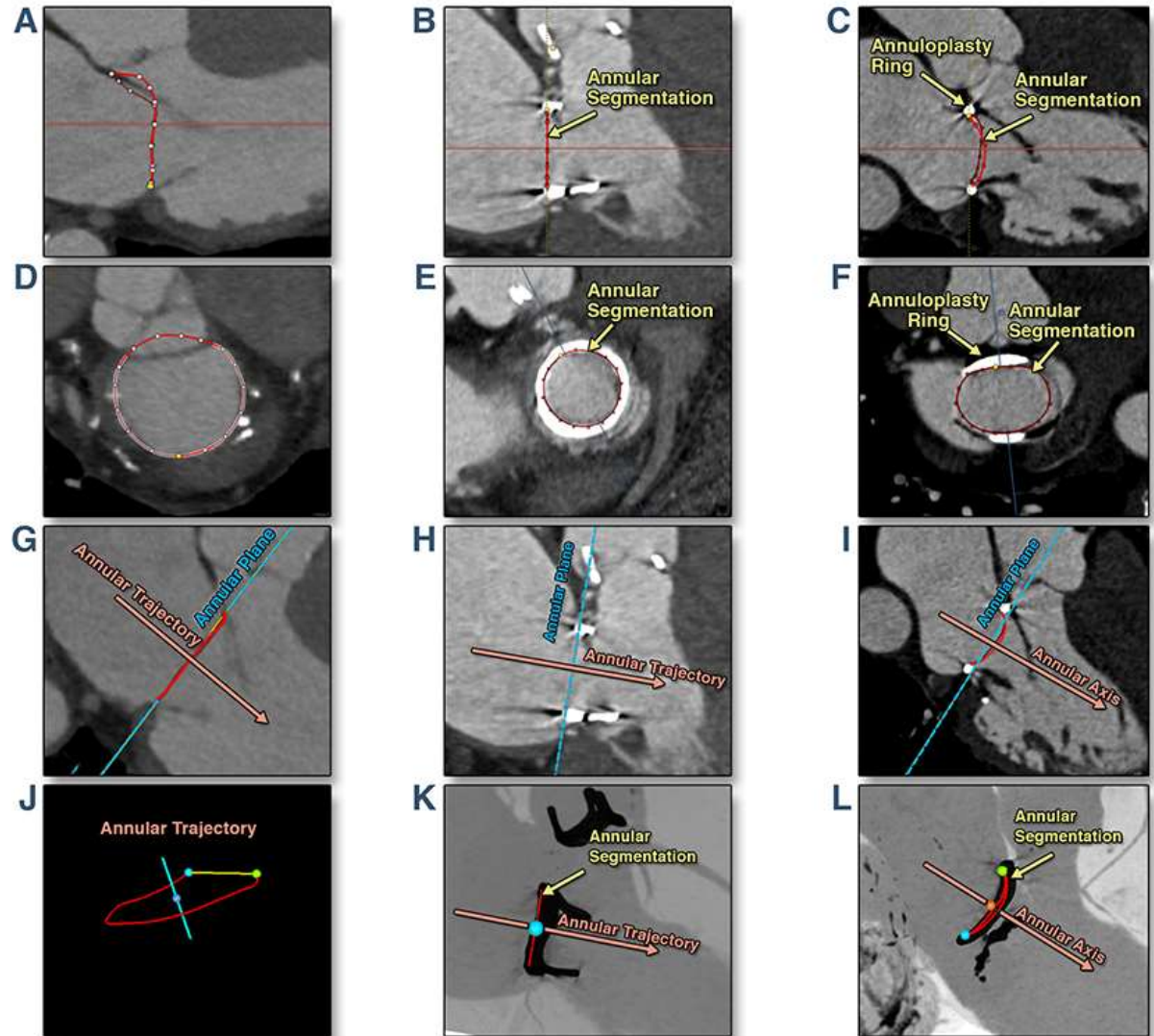
Annular segmentation

	MR patients		
	MVP N=24	FMR N=20	P- value *
Mitral annular dimensions			
Absolute value			
Area – cm ²	12.9±2.7 ^c	10.5±2.3 ^b	.004
TT distance – mm	34.2±3.4 ^c	31.8±2.5 ^c	.01
SL distance – mm	34.2±4.3 ^c	31.5±3.9 ^c	.04
IC distance – mm	43.9±5.0 ^c	38.4±4.4	<.001
Value indexed to BSA			
Area – cm ² /m ²	7.2±1.5 ^c	5.6±1.3 ^c	<.001
TT distance – mm/m ²	19.1±1.8 ^c	17.0±1.8 ^c	<.001
SL distance – mm/m ²	19.1±2.9 ^c	16.8±2.8 ^c	.01
IC distance – mm/m ²	24.6±3.0 ^c	20.5±2.7	<.001
IC/SL ratio	1.29±0.10 ^a	1.23±0.11 ^c	.051



1. Mitral Annular Geometry

Annular segmentation

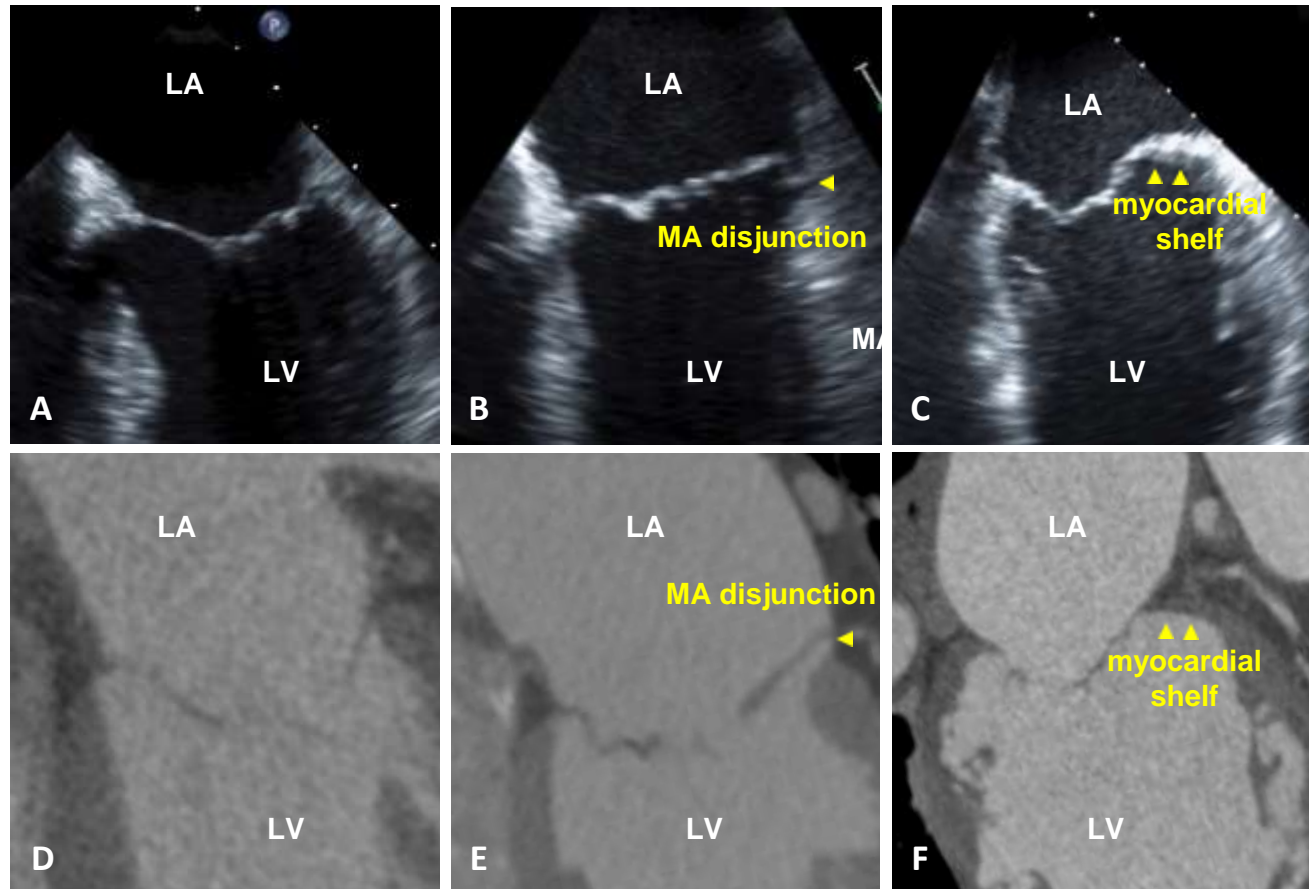


2. Landing Zone Characterization



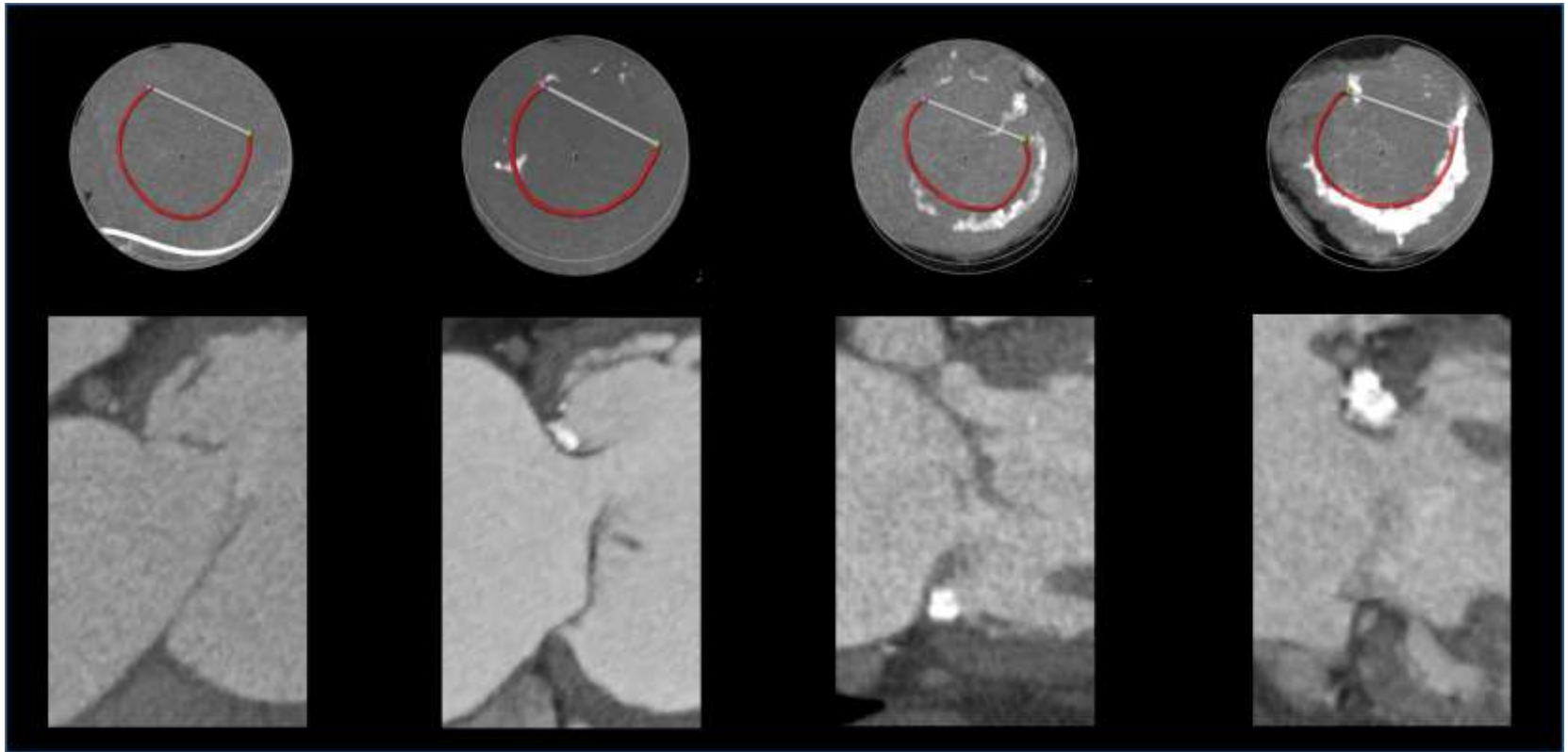
2. Landing Zone Characterization

Landing zone differs among mitral pathologies and patients



2. Landing Zone Characterization

Mitral annular calcium

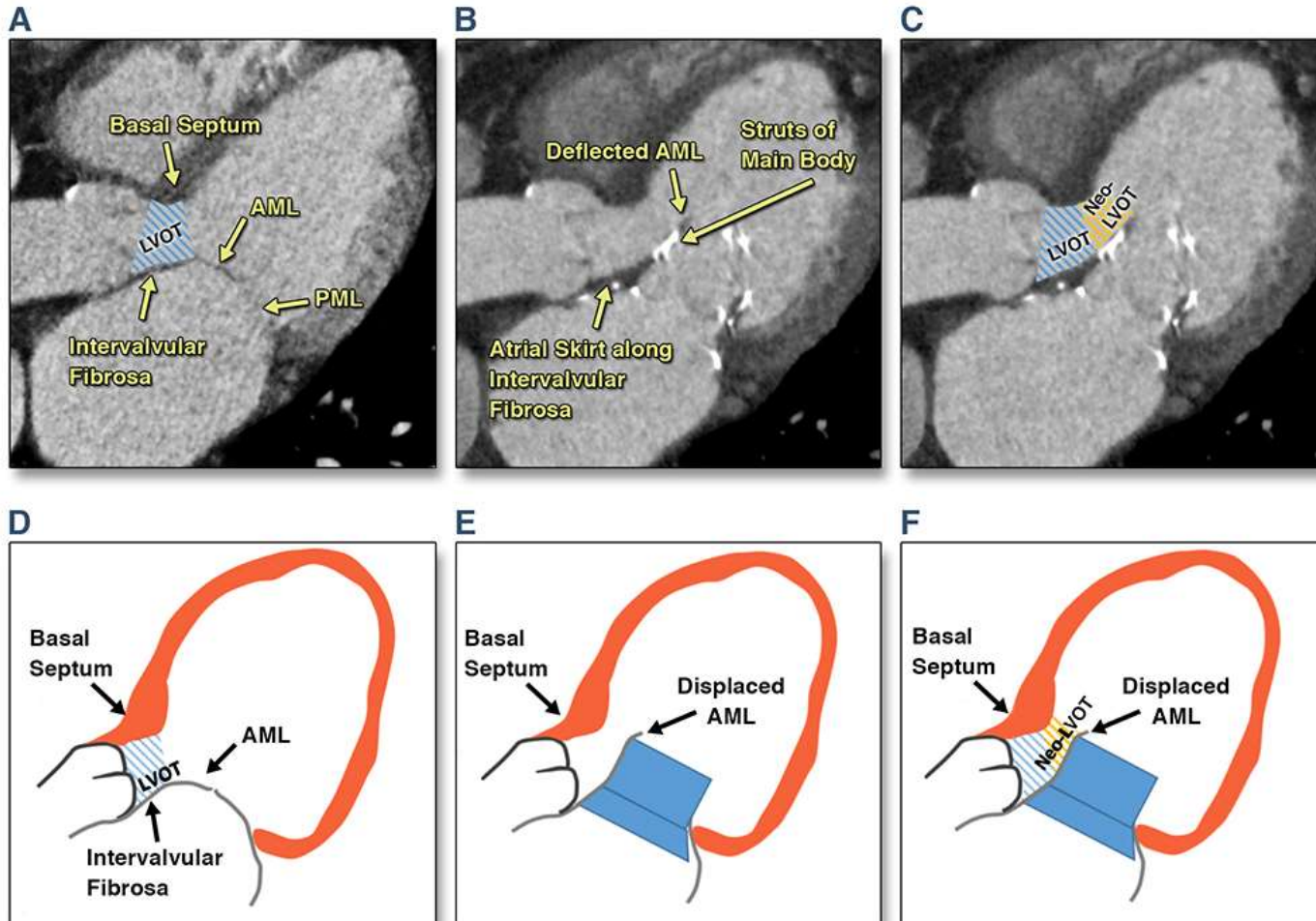


3. Prediction of LVOT Obstruction



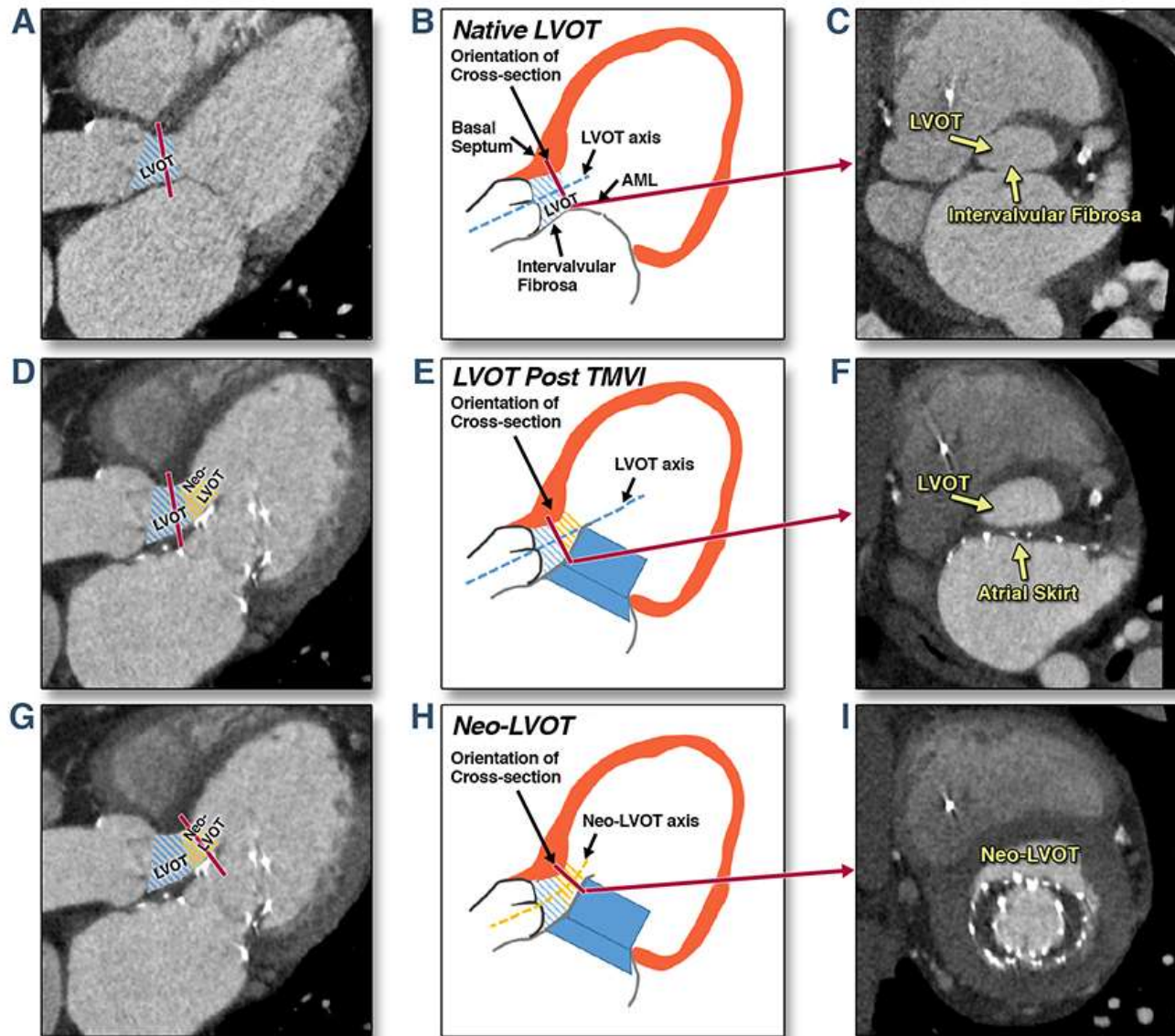
3. Prediction of LVOT obstruction

Neo-LVOT



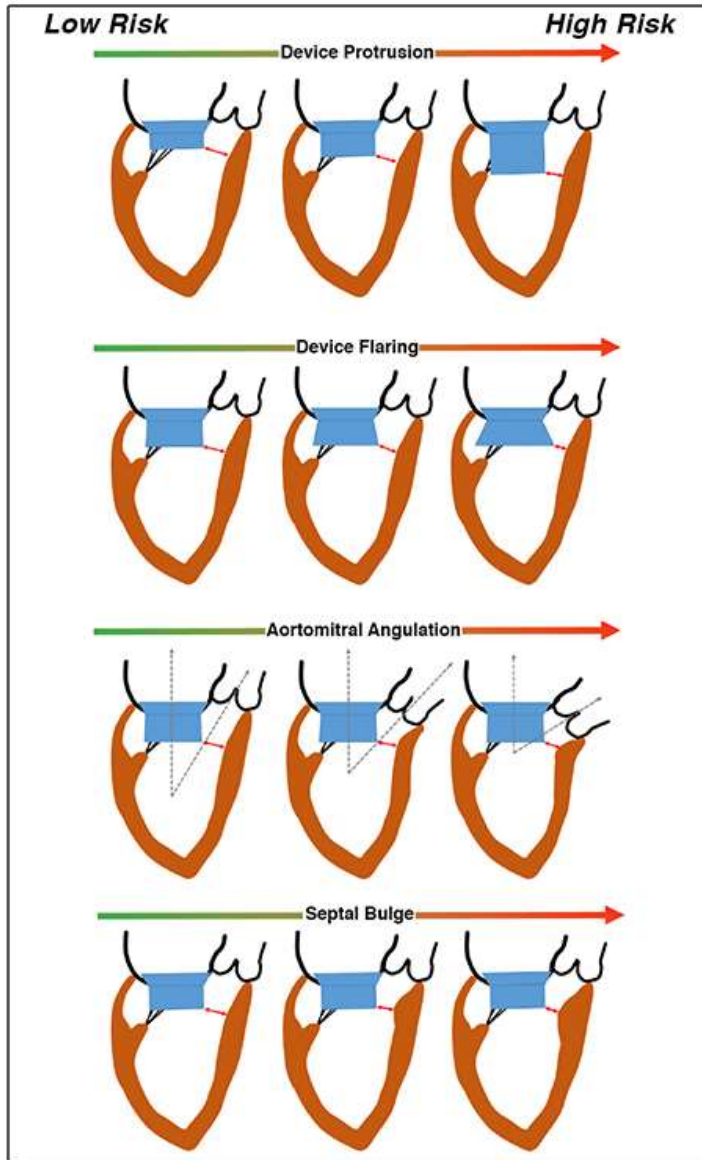
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Neo-LVOT



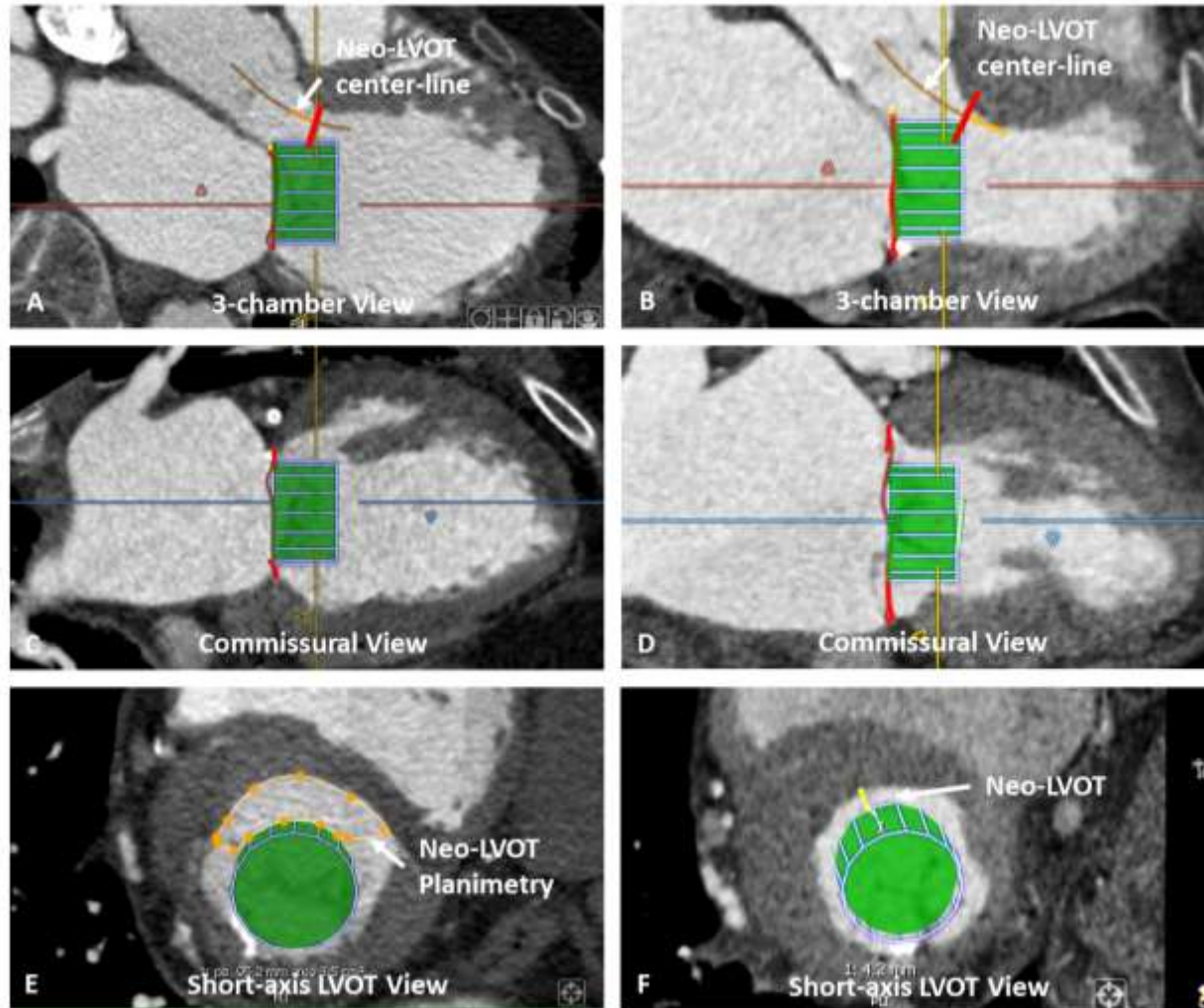
3. Prediction of LVOT obstruction

Anatomy & Device Related Factors



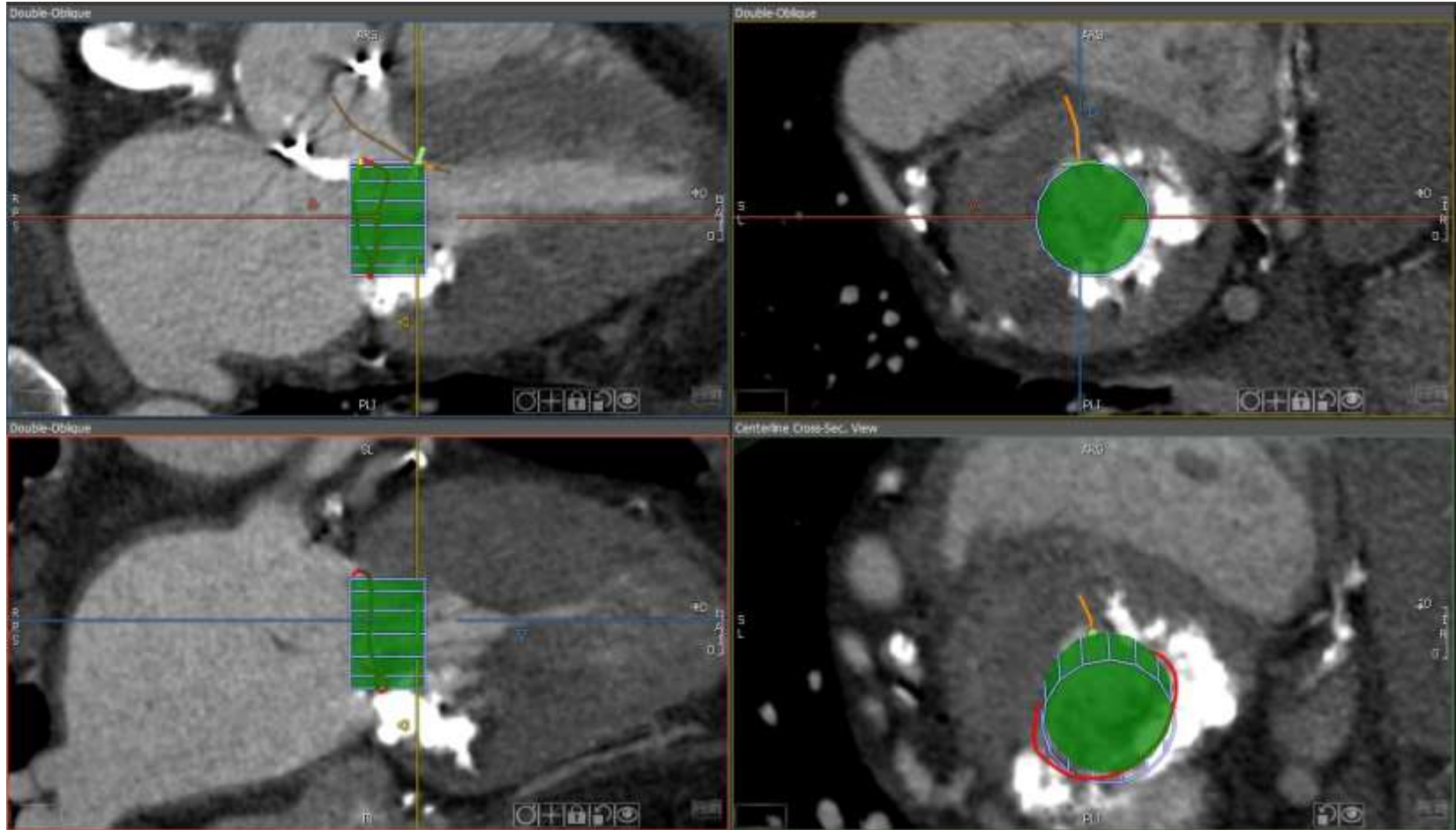
3. Prediction of LVOT obstruction

Simulation of Device Implantation



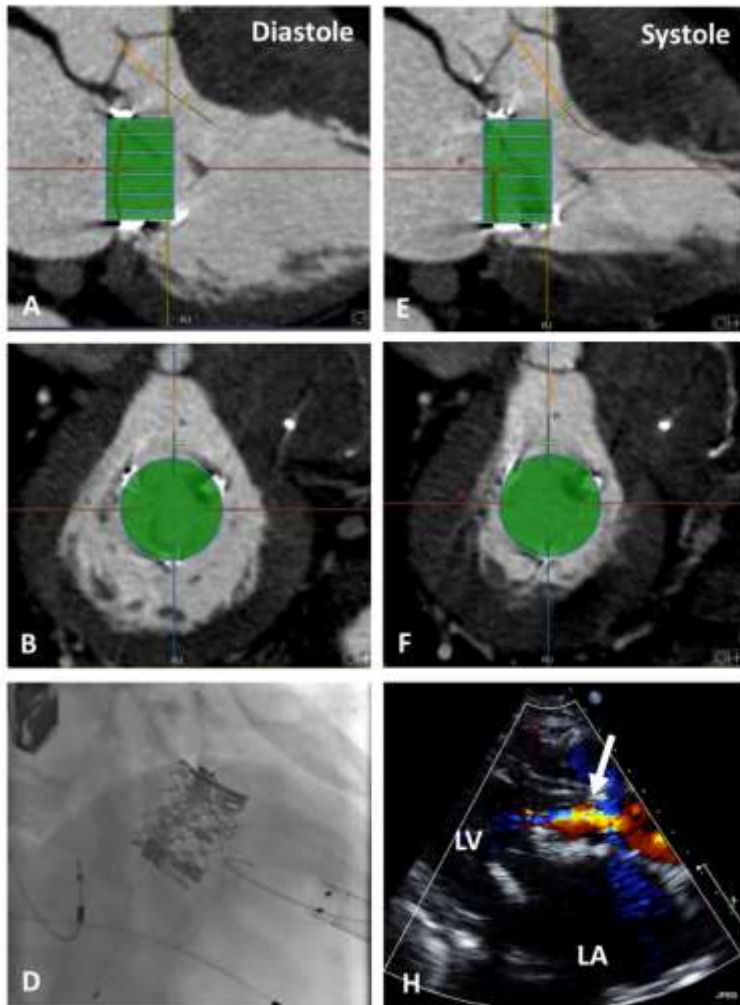
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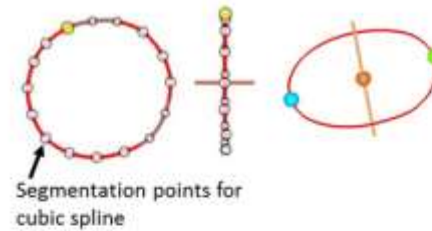


3. Prediction of LVOT obstruction

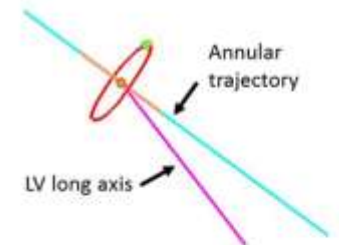
Simulation of Device Implantation



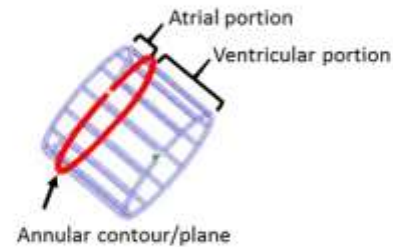
1. Annular segmentation



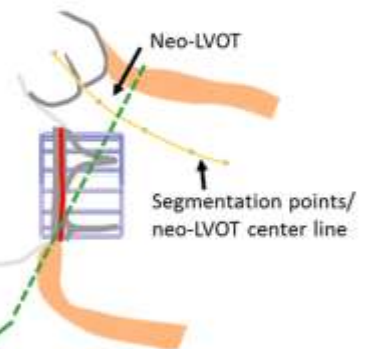
2. Mitral trajectory



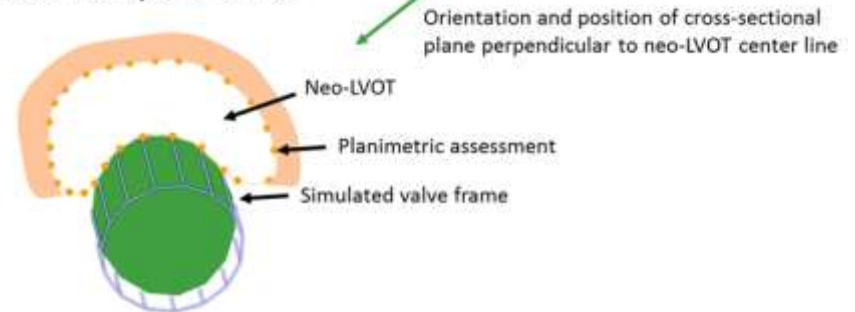
3. Valve simulation



4. Neo-LVOT Centerline

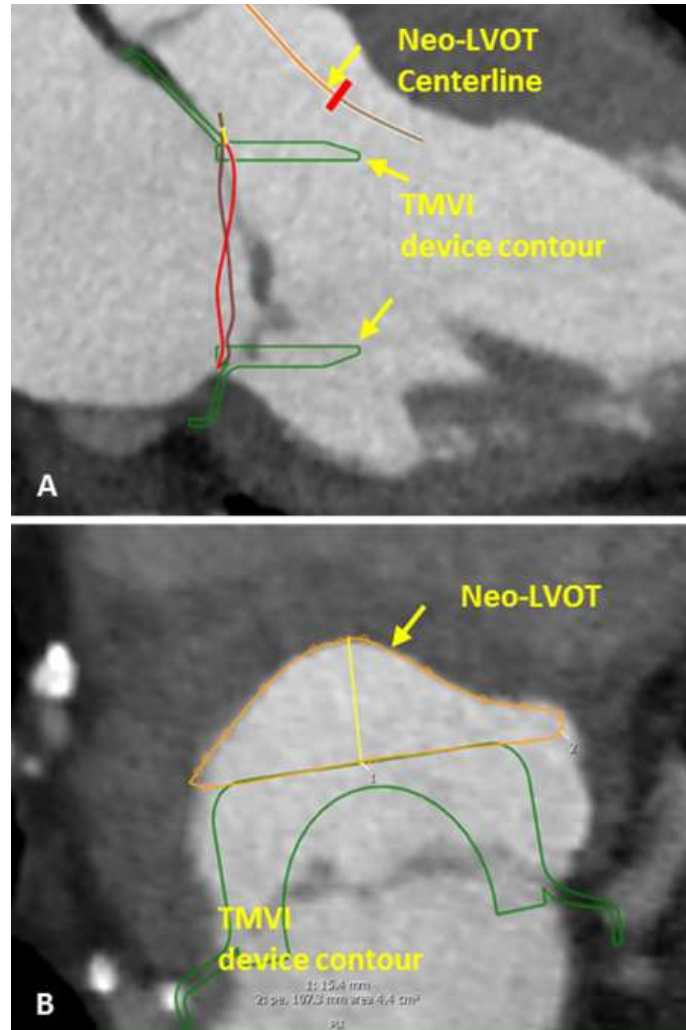


5. Neo-LVOT quantification



3. Prediction of LVOT obstruction

Simulation of Device Implantation

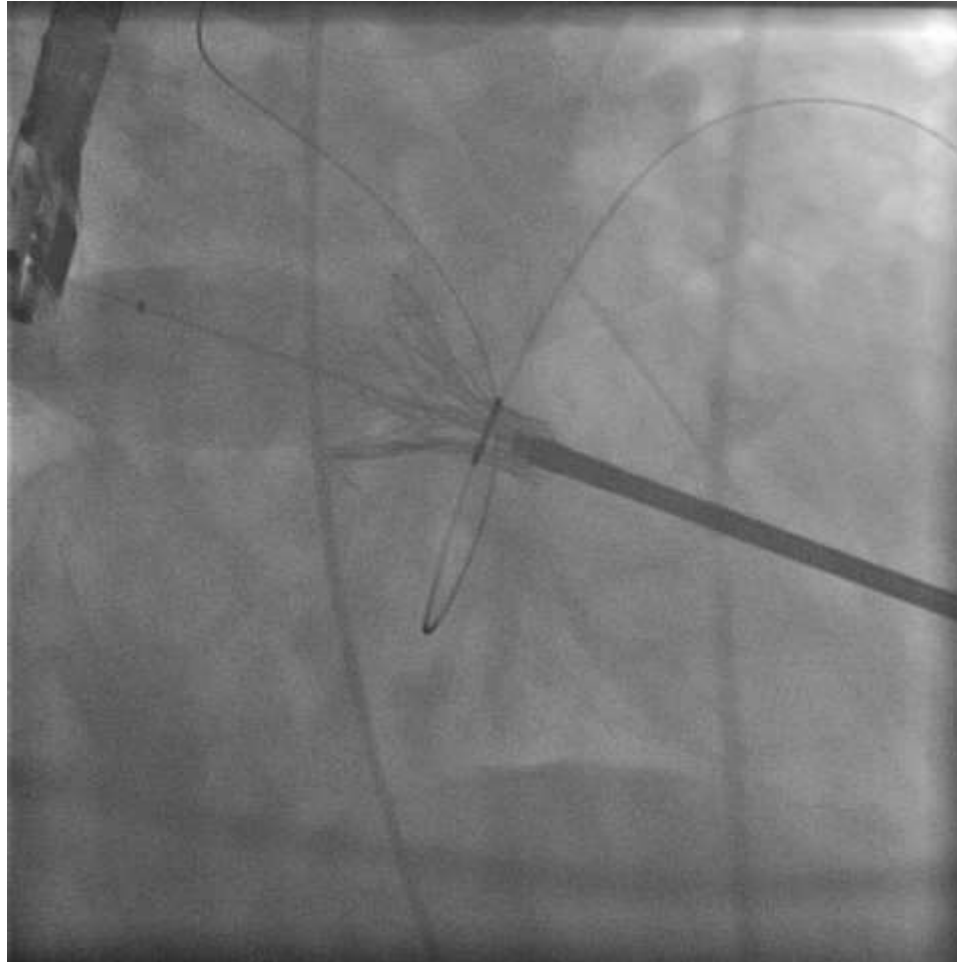


4. Prediction of Fluoroscopy Angulation



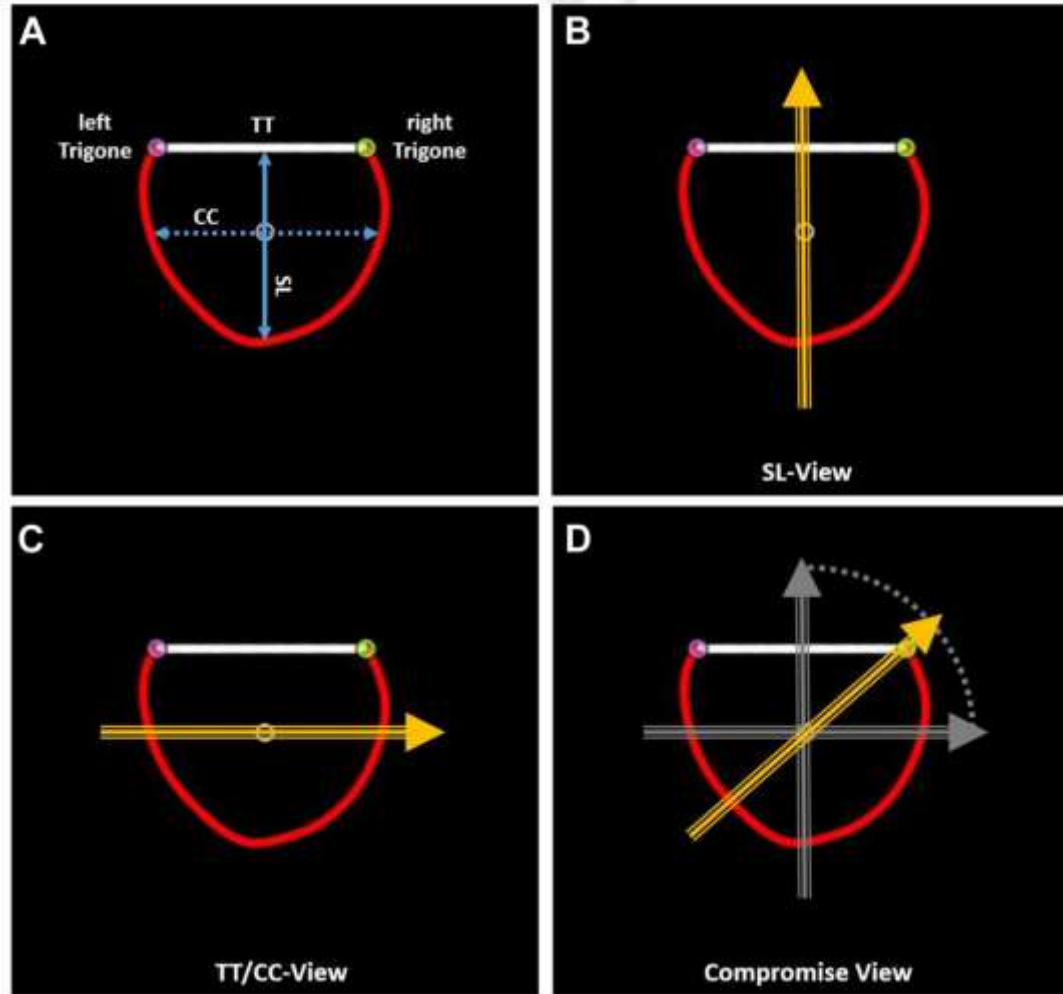
4. Prediction of Fluoroscopy Angulation

Coplanar View to facilitate Coaxial Deployment



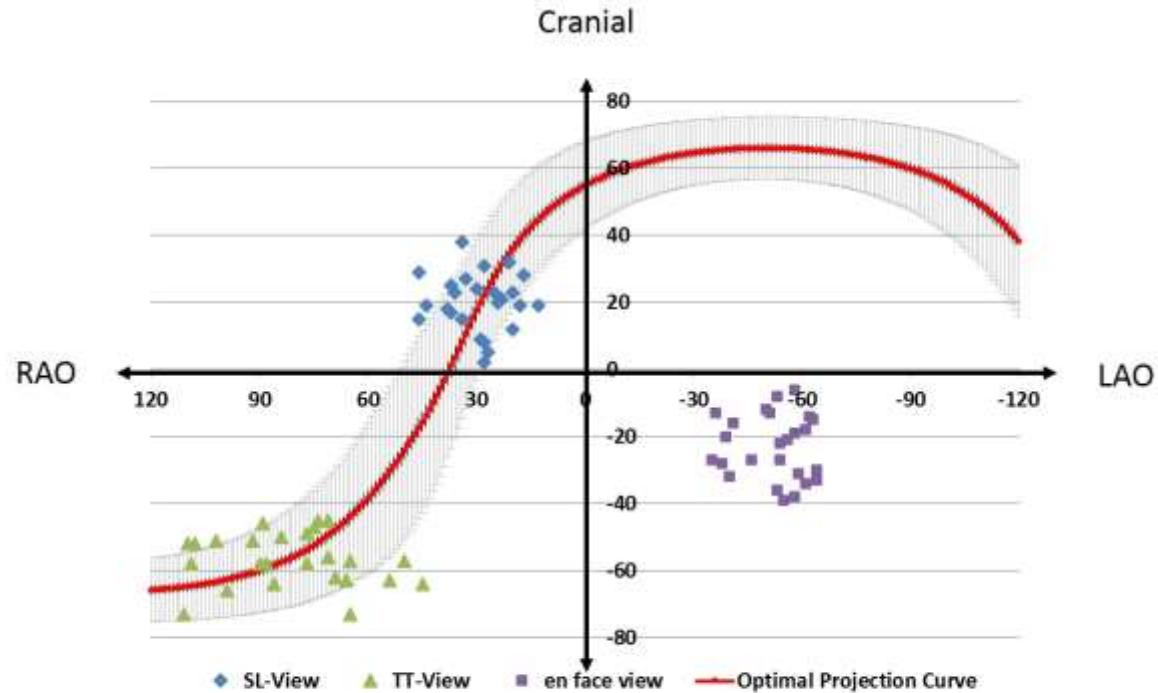
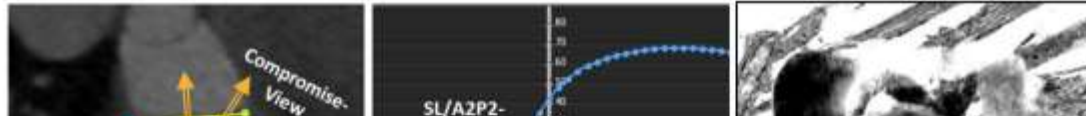
4. Prediction of Fluoroscopy Angulation

Asymmetry of the Mitral Annulus



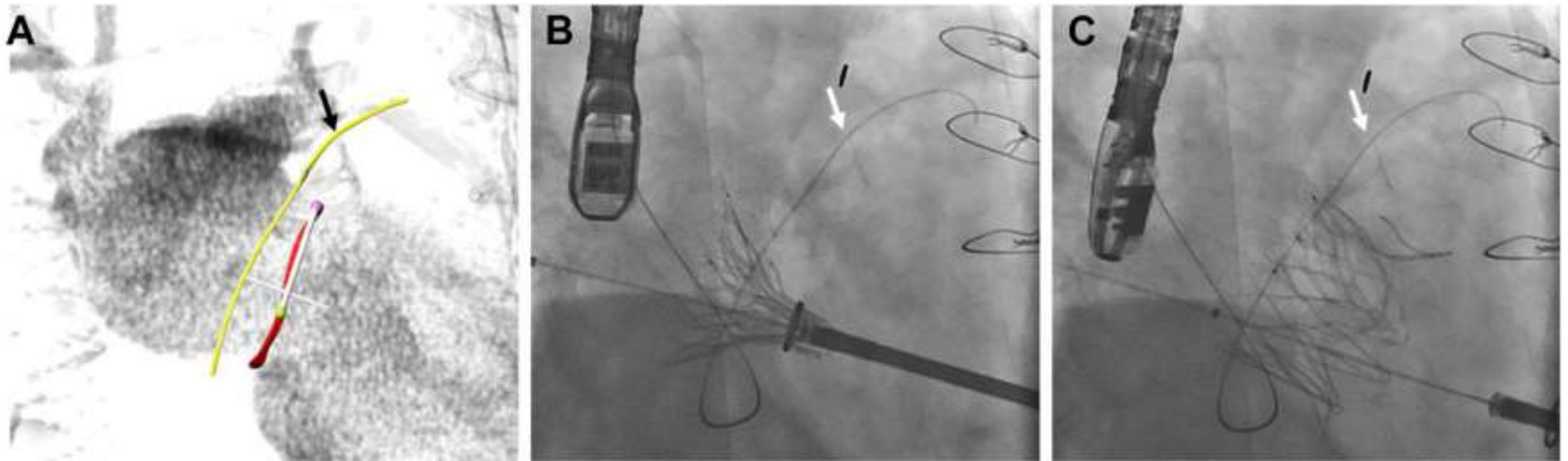
4. Prediction of Fluoroscopy Angulation

Coplanan View to facilitate Coaxial Deployment



4. Prediction of Fluoroscopy Angulation

Coronary sinus guide wire as an anatomical landmark

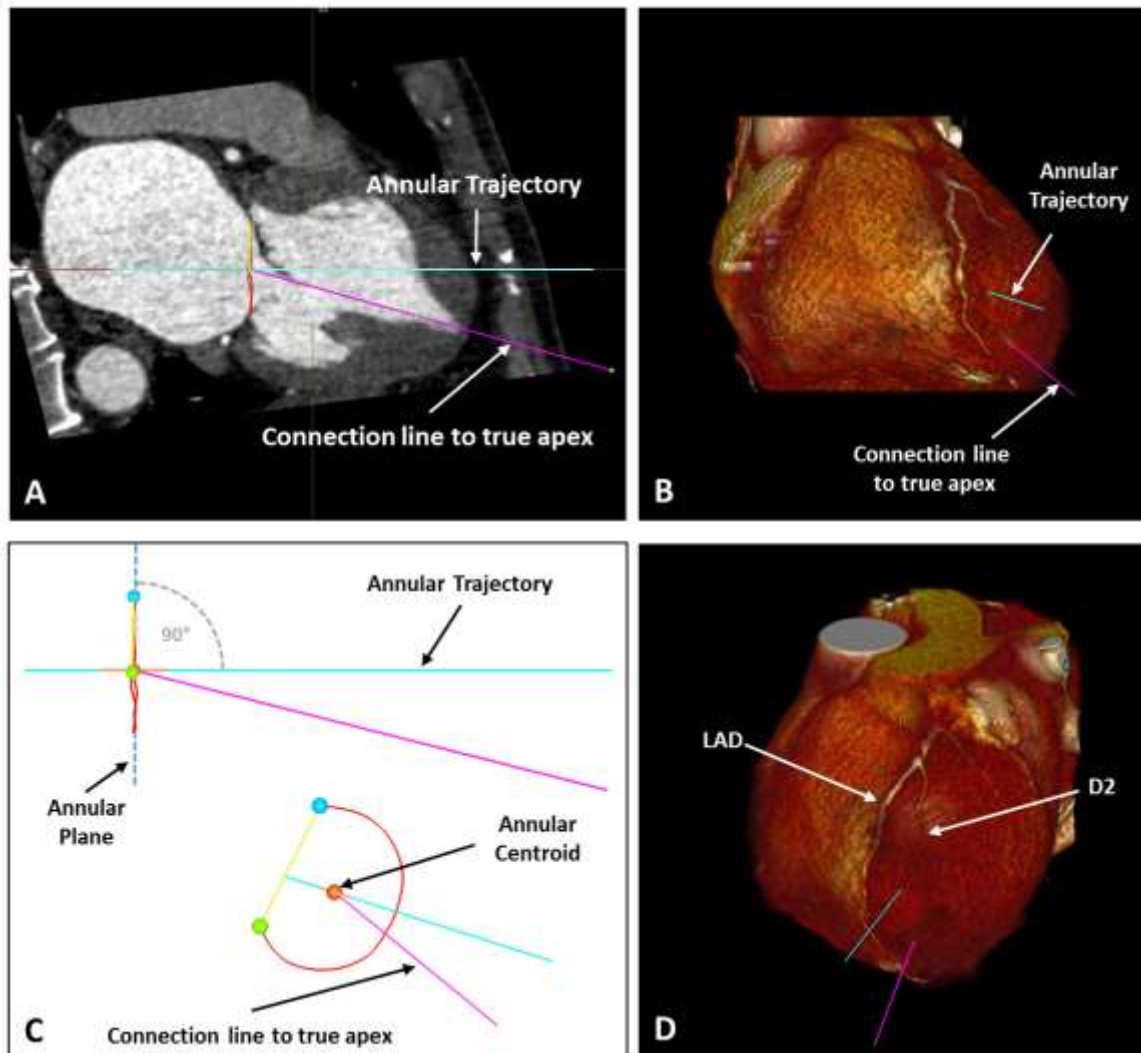


5. Access Planning



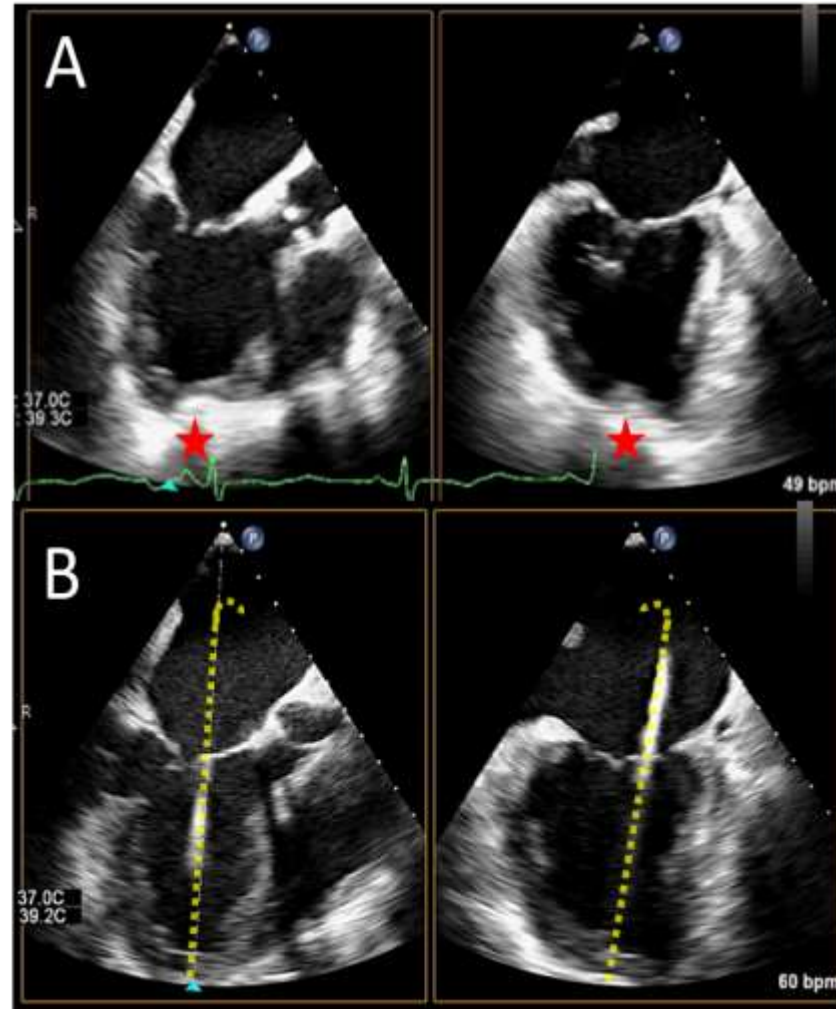
5. Access Planning

Transapical access



5. Access Planning

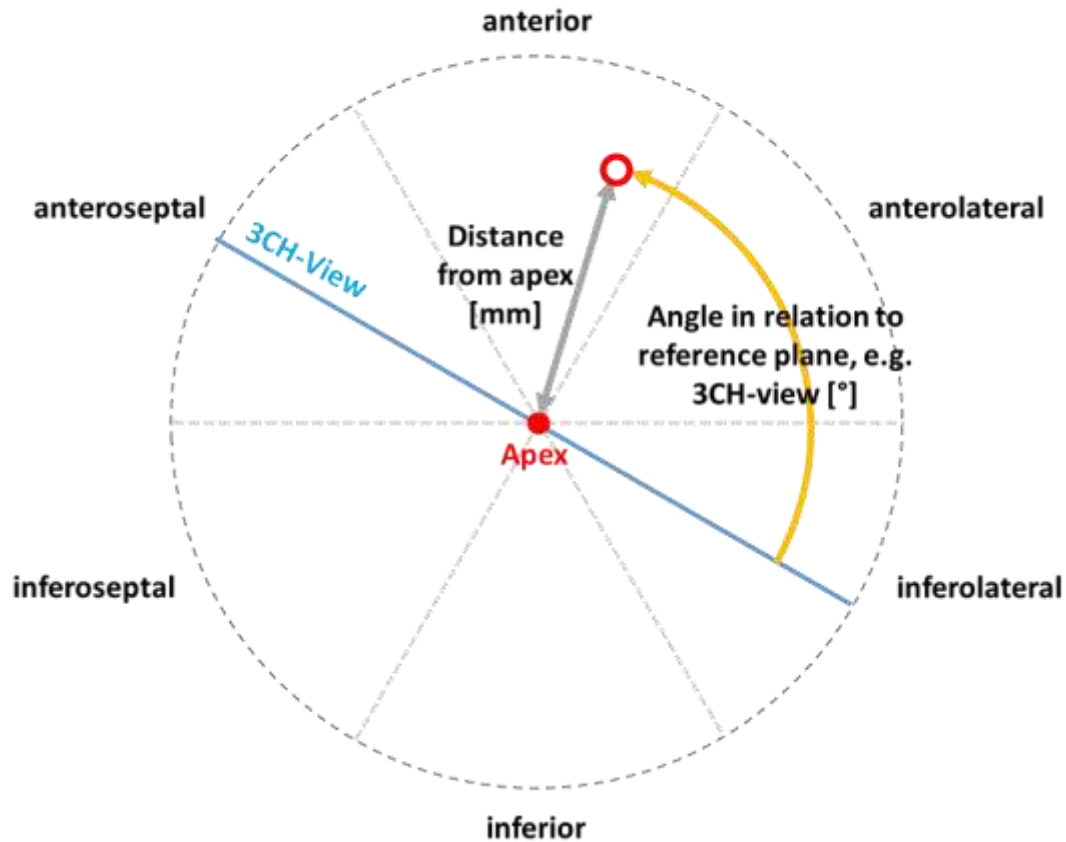
Transapical access



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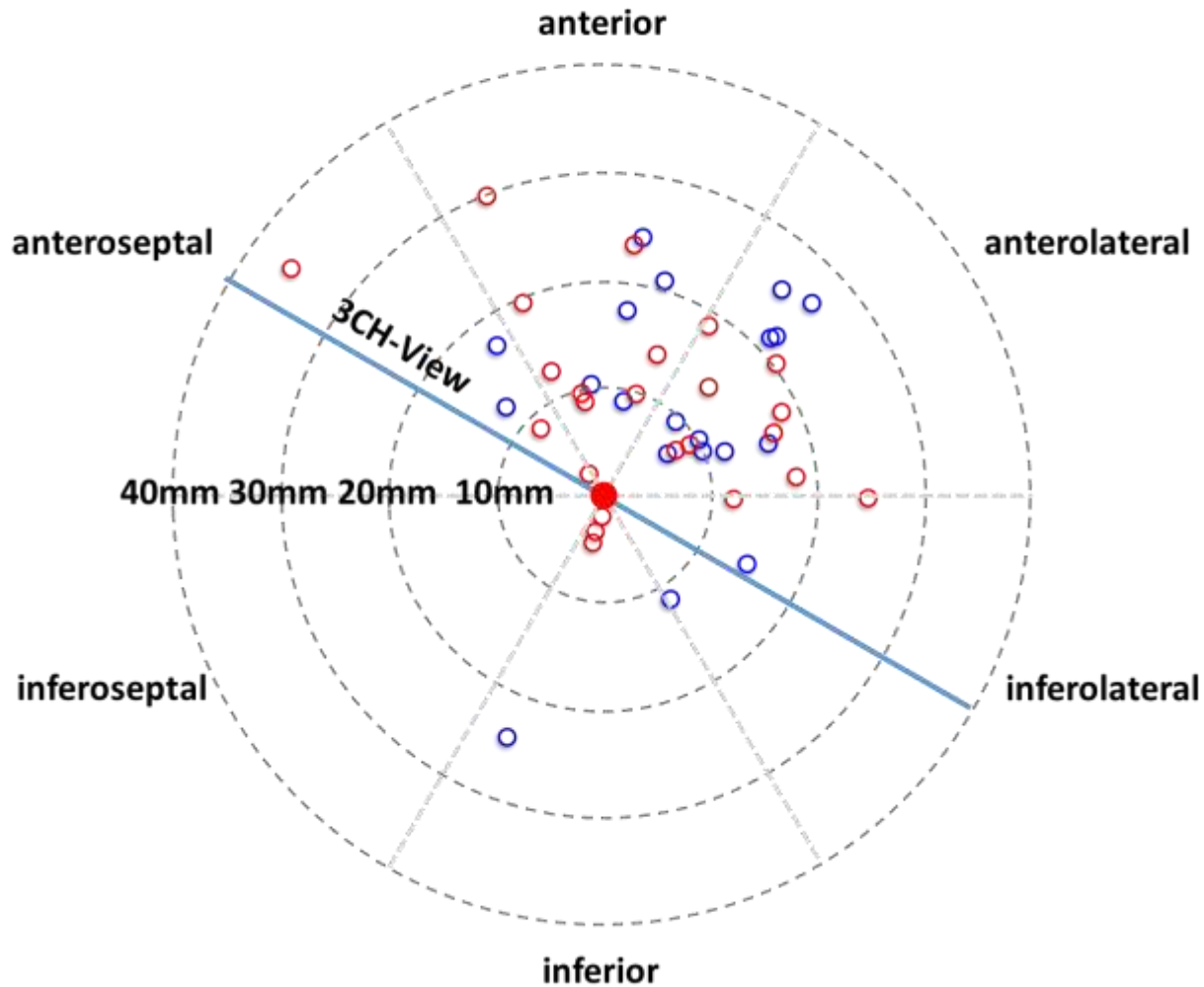
Transapical access

Access-point coordinates



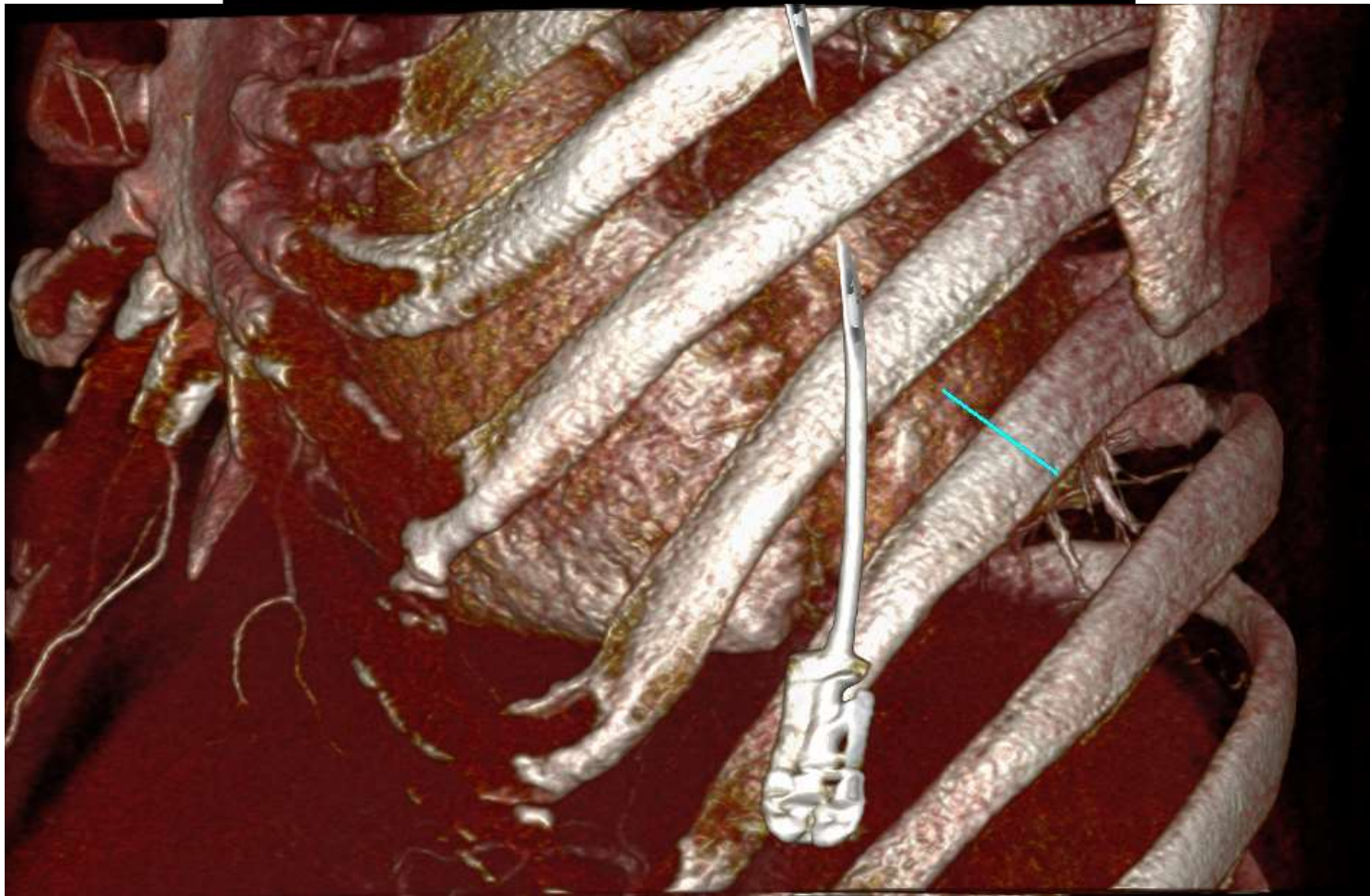
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CT Assessment for Mitral Valve Procedures

Input & Output

