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

How to Assess Coronary Obstruction Risk on CT Prior to Aortic Valve-in-Valve Procedures

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Disclosures

Consultant to

Edwards Lifesciences

Neovasc

Circle Imaging

SPH Cardiac CT Core Lab, providing services to

Edwards Lifesciences

Neovasc

Tendyne Holdings

Medtronic

Coronary obstruction in Valve-in-Valve Procedures

Background

Original Investigation

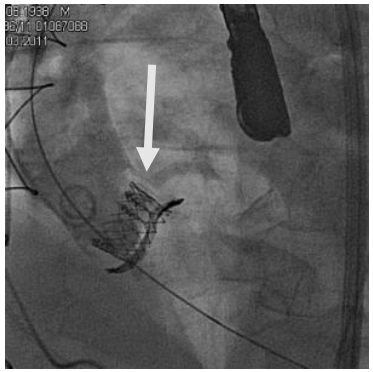
Transcatheter Aortic Valve Implantation in Failed Bioprosthetic Surgical Valves

Danny Dvir, MD; John G. Webb, MD; Sabine Bleiziffer, MD; Miralem Pasic, MD, PhD; Ron Waksman, MD; Susheel Kodali, MD; Marco Barbanti, MD; Azeem Latib, MD; Ulrich Schaefer, MD; Josep Rodés-Cabau, MD; Hendrik Treede, MD; Nicolo Piazza, MD, PhD; David Hildick-Smith, MD; Dominique Himbert, MD; Thomas Walther, MD; Christian Hengstenberg, MD; Henrik Nissen, MD, PhD; Raffi Bekeredjian, MD; Patrizia Presbitero, MD; Enrico Ferrari, MD; Amit Segev, MD; Arend de Weger, MD; Stephan Windecker, MD; Neil E. Moat, FRCS; Massimo Napodano, MD; Manuel Wilbring, MD; Alfredo G. Cerillo, MD; Stephen Brecker, MD; Didier Tchetche, MD; Thierry Lefèvre, MD; Federico De Marco, MD; Claudia Fiorina, MD; Anna Sonia Petronio, MD; Rui C. Teles, MD; Luca Testa, MD; Jean-Claude Laborde, MD; Martin B. Leon, MD; Ran Kornowski, MD; for the Valve-in-Valve International Data Registry Investigators

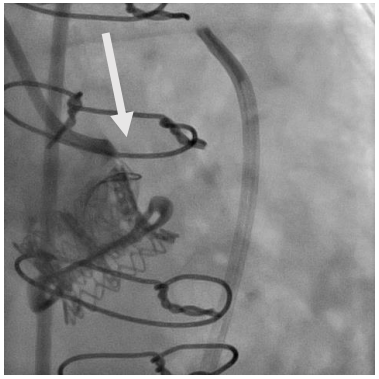
- 459 patients with failed surgical bioprostheses
- Coronary obstruction in 2% of ViV procedures (*3.5% 2012*)
- Predispoing valve types: internally stented Mitroflow, Trifecta, stentless

Dvir et al. 2012, Dvir et al. 2014

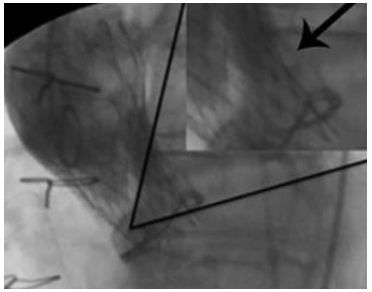
Complications Remain- Ostial Coronary Obstruction



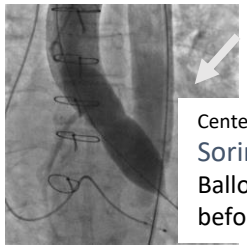
Center #30, case#3
Mitroflow 25mm (ID 21mm)
Tranapical Edwards-SAPIEN 23mm



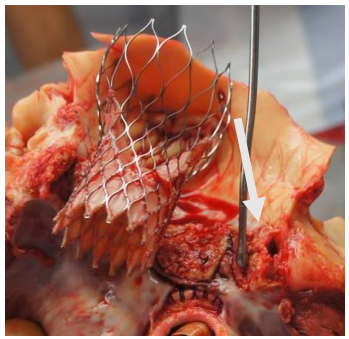
Center #37, case#9
Mitroflow 21mm (ID 17.3mm)
Transapical Edwards-SAPIEN 23mm



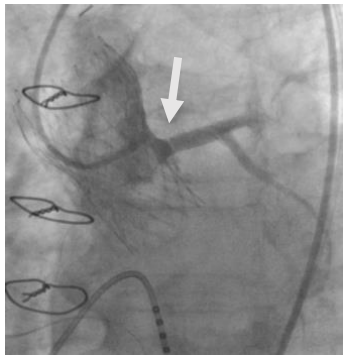
Center #34, case#6
Mitroflow 21mm (ID 17.3mm)
Tranfemoral CoreValve 26mm



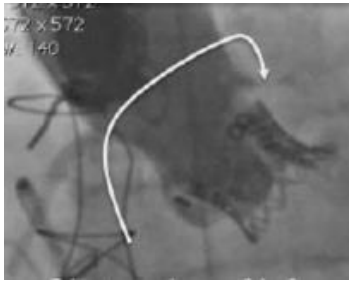
Center #29, case#7
Sorin Freedom Stentless 21mm (ID 19mm)
Balloon Valvuloplasty
before attempted CoreValve implantation



Center #13, case#4
Sorin Freedom Stentless 23mm (ID 21mm)
Transfemoral CoreValve 26mm



Center #27, case#3
CryoLife O'Brien (stentless) 25mm (ID 23mm)
Transfemoral CoreValve 29mm



Center #11, case#11
Mosaic 21mm (ID 18.5mm)
Transapical Edwards-SAPIEN 23mm

Courtesy of Danny Dvir/VIVID Registry

Coronary obstruction in Valve-in-Valve Procedures

Valve design

Mitroflow #27 in an aortic root model

Valve-in-Valve with SAPIEN 29mm

Dvir et al. 2014

Coronary obstruction in Valve-in-Valve Procedures

Potential risk factors

- Anatomic factors
  - Narrow sinotubular junction/low sinus height
  - Narrow sinuses of Valsalva
  - Previous root repair (eg. root graft and coronary reimplantation)
  - Low-lying coronary ostia

- Bioprosthetic valve factors
  - Supra-annular position vs. Intra-annular
  - High leaflet profile
  - Internal stent frame (eg. MitroFlow, Trifecta)
  - No stent frame (homograft, stentless valves)
  - Bulky leaflets

- Transcatheter valve factors
  - Extended sealing cuff
  - High implantation

Dvir et al. 2014

Assessment for Valve-in-Valve Procedures

Anatomical issues and potential measurements

Common native root anatomy measures:

- Coronary artery height
- Sinus of Valsalva with
- Sinus height

versus

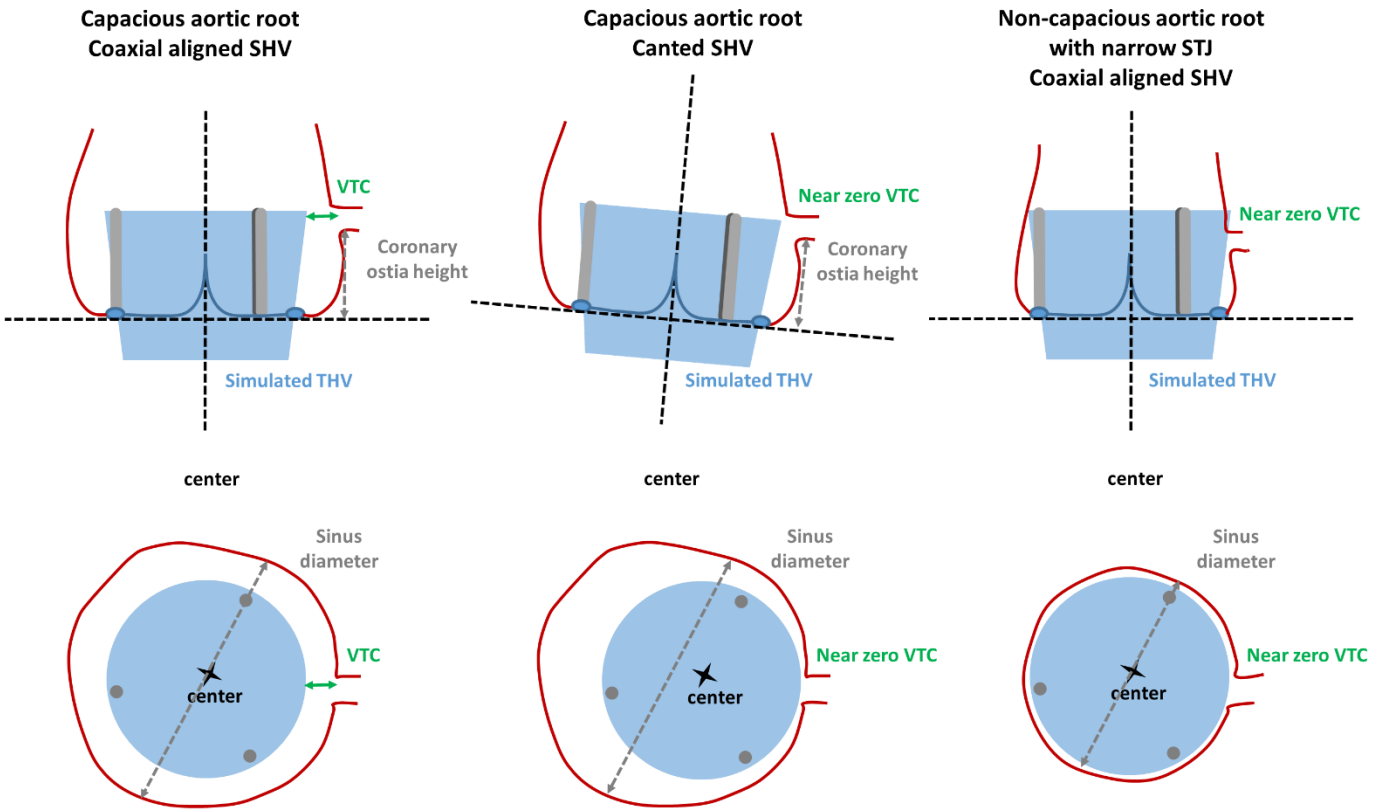
Distortion of Anatomy

- Tilting of the surgical prosthesis
- Lower coronary height

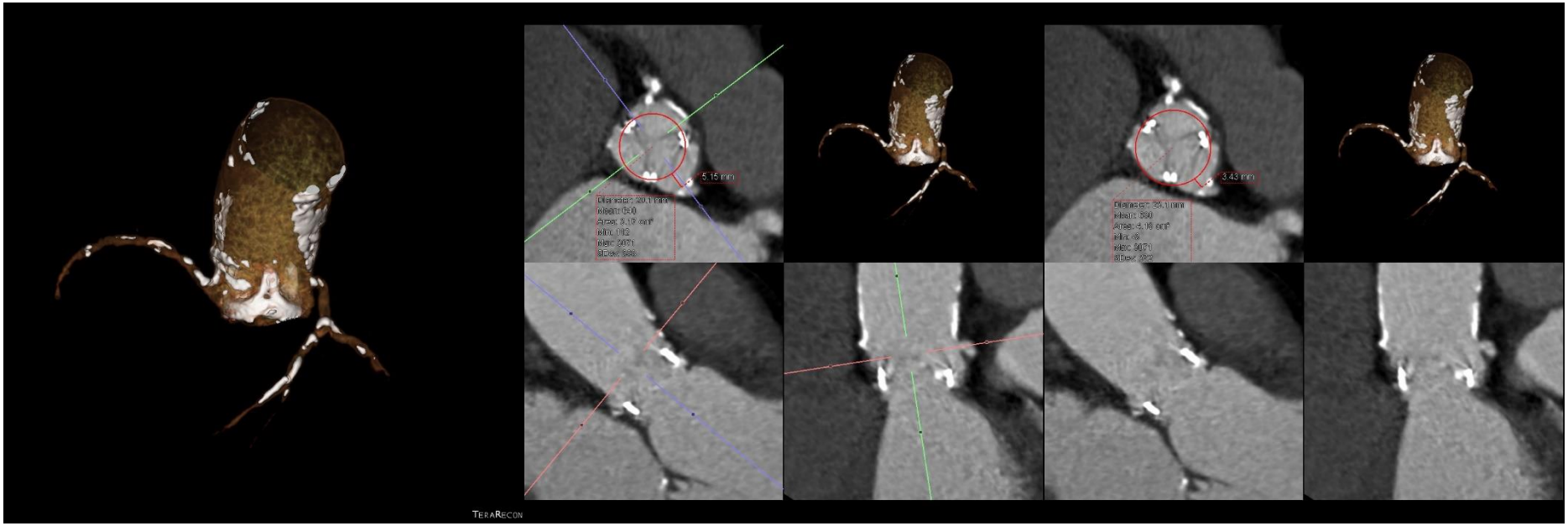
Prediction of the the proximity of the coronary ostia to the anticipated final position of the displaced bioprosthetic leaflets after THV implantation

Assessment for Valve-in-Valve Procedures

Virtual THV to Coronary (VTC) distance



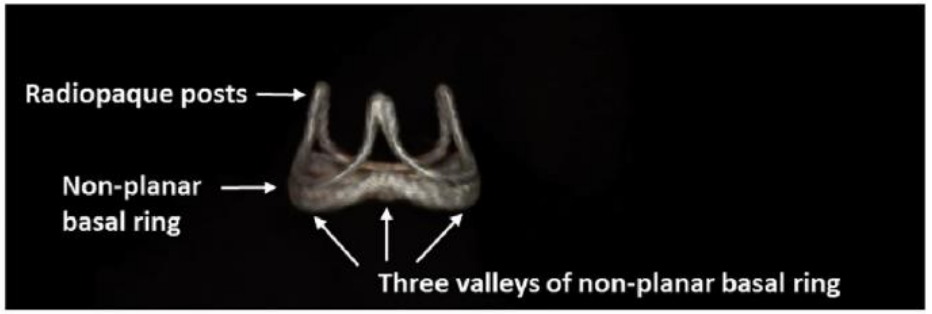
Dvir et al. 2014, Blanke et al. 2016


5.15 mm
3.43 mm
TeraRecon

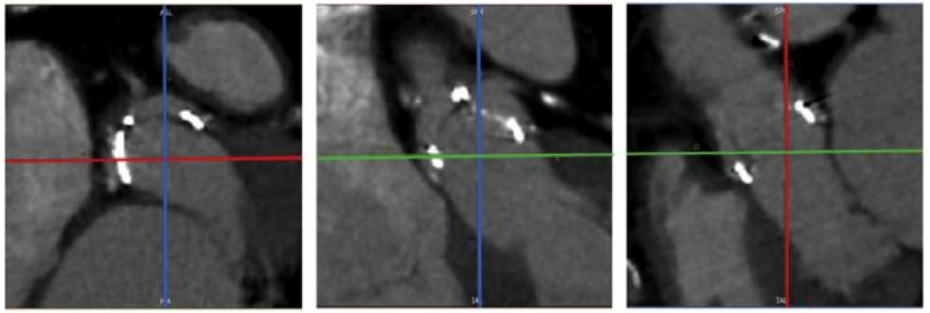
Assessment for Valve-in-Valve Procedures

Virtual THV to Coronary (VTC) distance

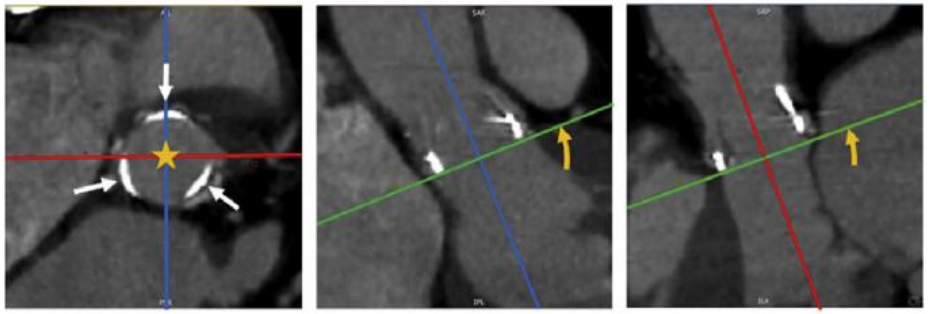
Step 1: Identify SHV, e.g. using a volume rendering



Step 2: Center cross-hairs with SHV



Step 3: Manipulate cross-hairs for double-oblique transverse plane to match basal ring (here three valleys, white arrows); center of cross-hairs centered within basal ring (asterisk)

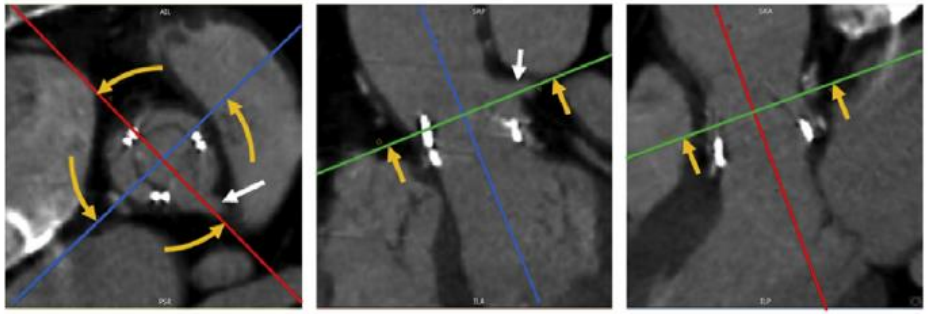


Blanke et al. JCCT 2016

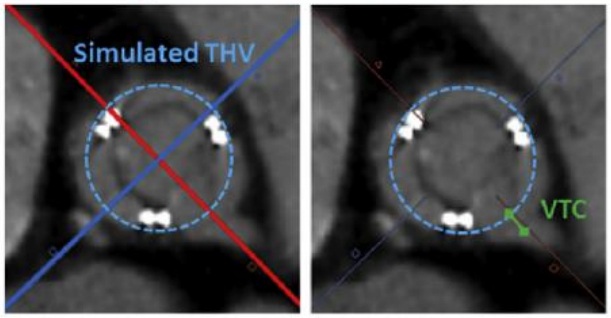
Assessment for Valve-in-Valve Procedures

Virtual THV to Coronary (VTC) distance

Step 4: Move double-oblique transverse plane to level of coronary ostium (here left main, white arrows); rotate views for better visualization of coronary ostium



Step 5: Simulate THV e.g. using a region of interest of a specific diameter (dashed circle, center matches center of cross-hairs); subsequently assess VTC as distance measurement between simulated THV and coronary orifice (green line)



Blanke et al. JCCT 2016

Assessment for Valve-in-Valve Procedures

Virtual THV to Coronary (VTC) distance

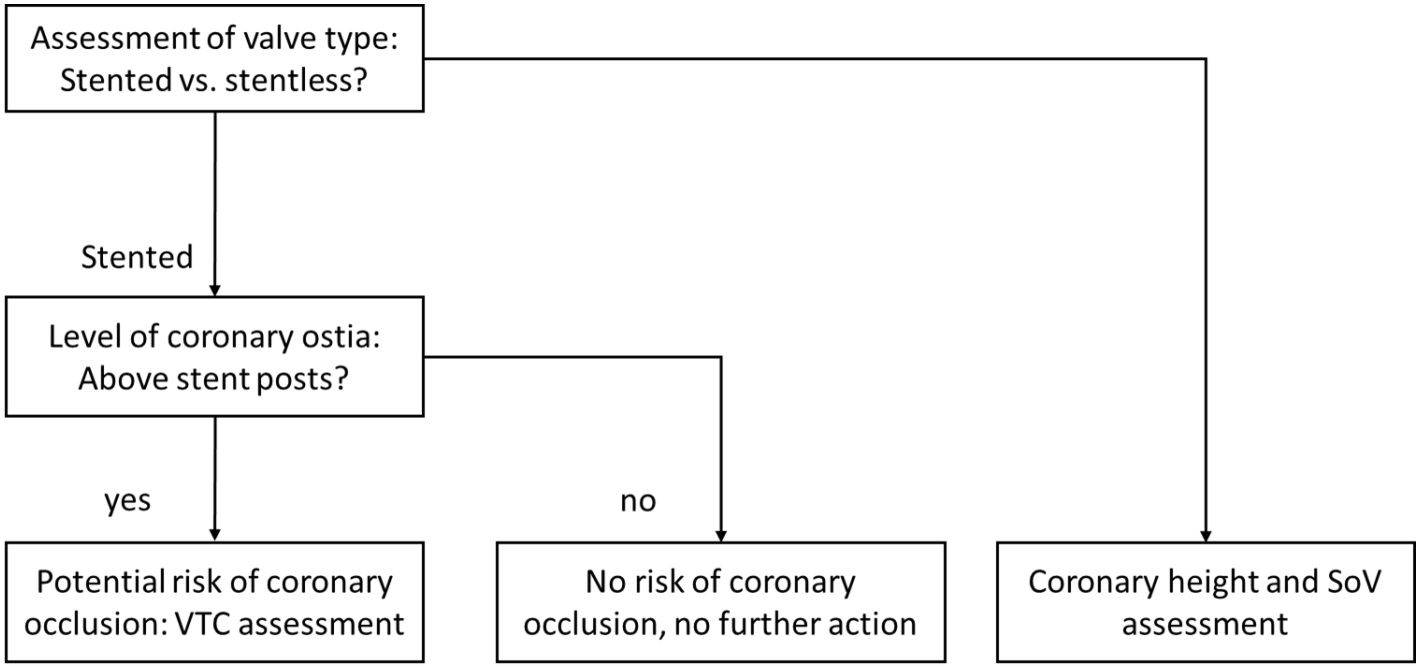
Advanced postprocessing

Pay attention to STJ above ostium as sealing may occur up there!

Blanke et al. JCCT 2016

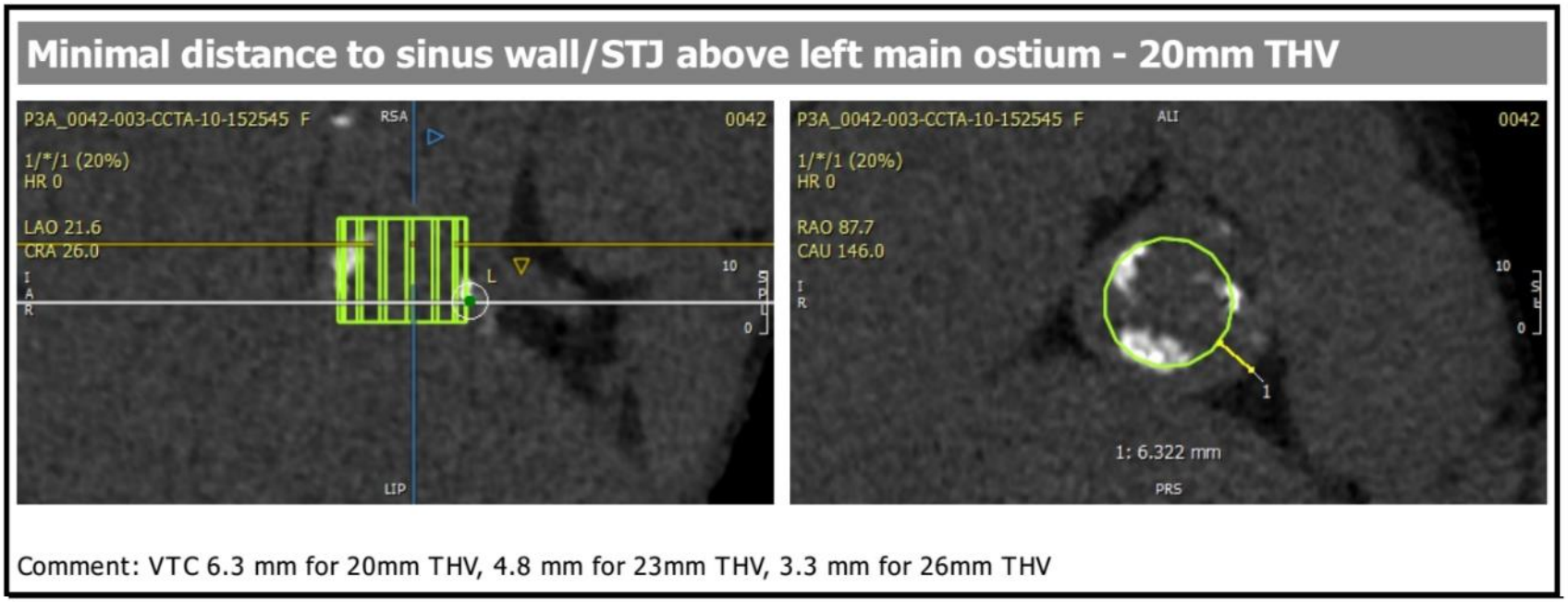
Assessment for Valve-in-Valve Procedures

Workflow



Assessment for Valve-in-Valve Procedures

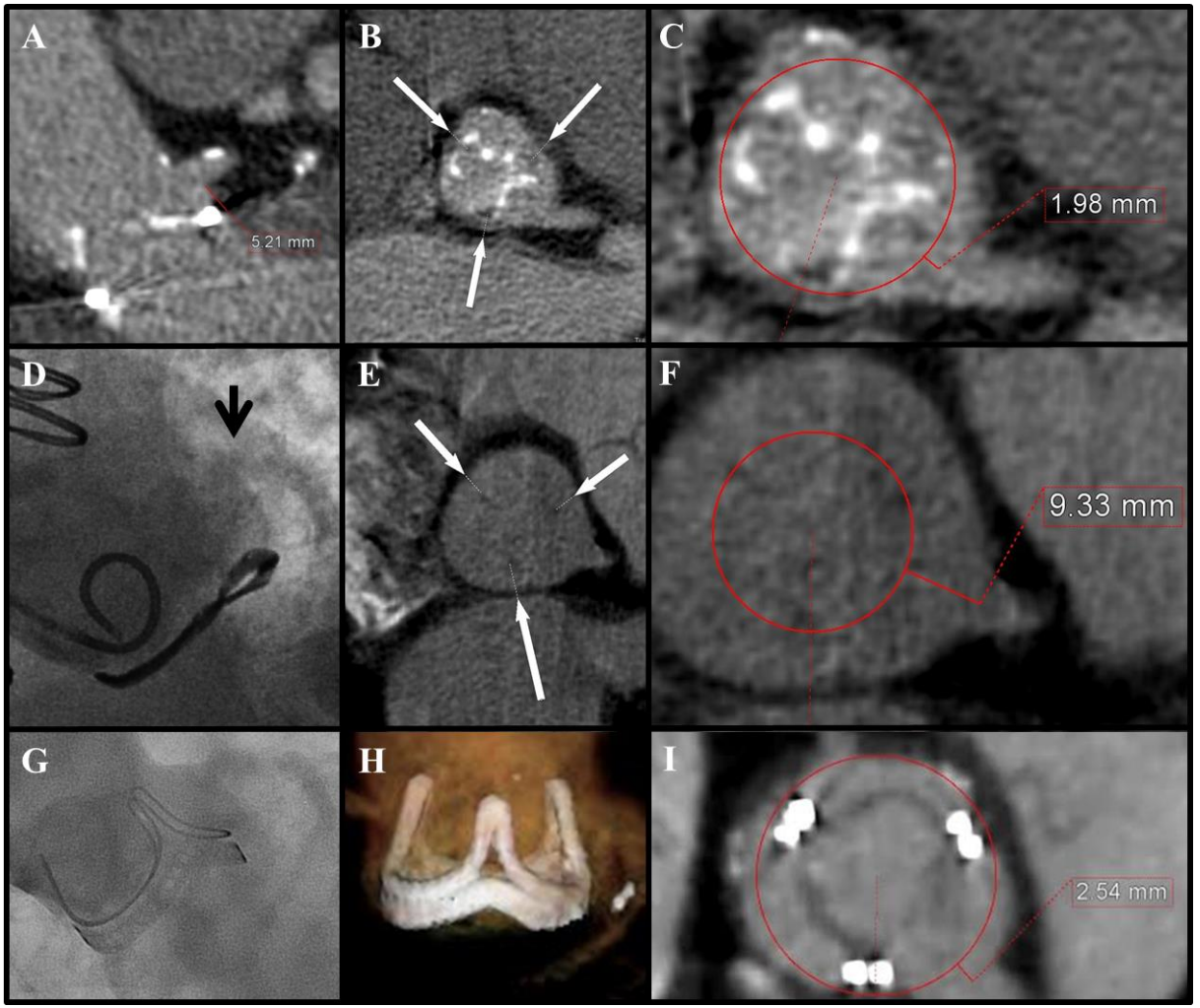
Virtual THV to Coronary (VTC) distance



Non-contrast images are sufficient, but need to be gated!

Assessment for Valve-in-Valve Procedures

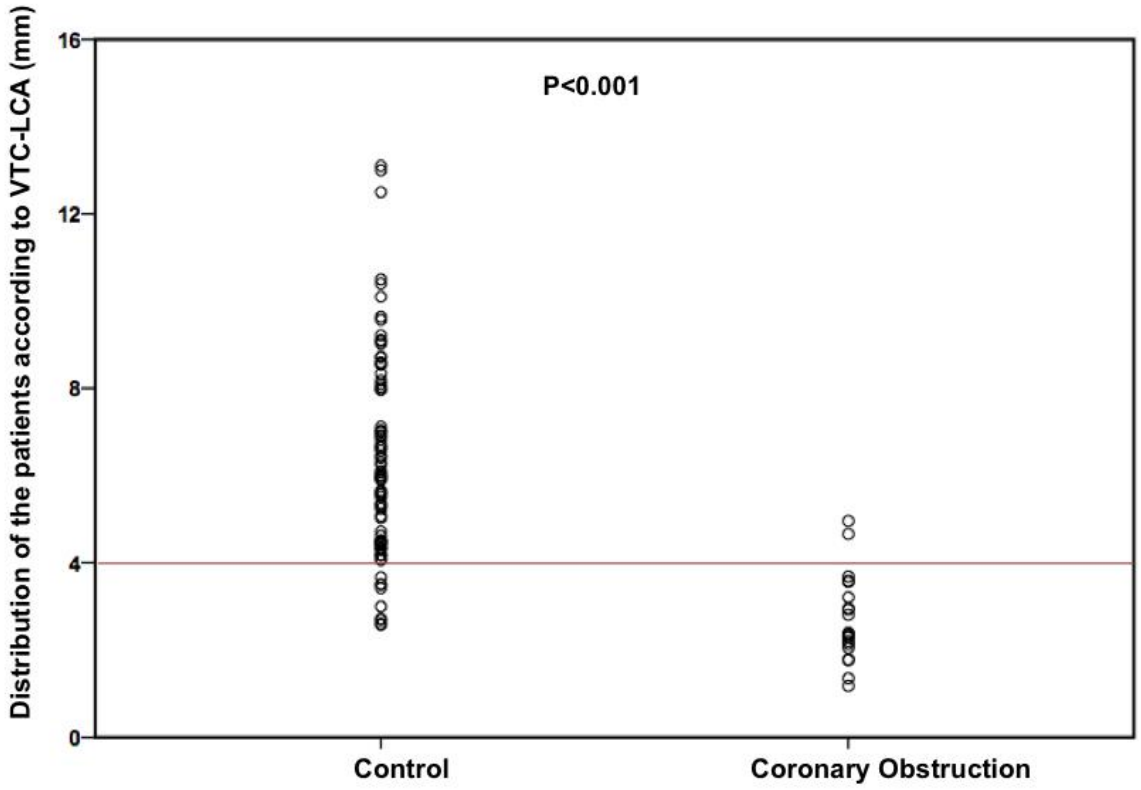
Example



Dvir et al. 2014

Assessment for Valve-in-Valve Procedures

Virtual THV to Coronary (VTC) distance



Magic number – 4mm?

VIVID Registry, presented at TCT 2016 (Ribiero et al)