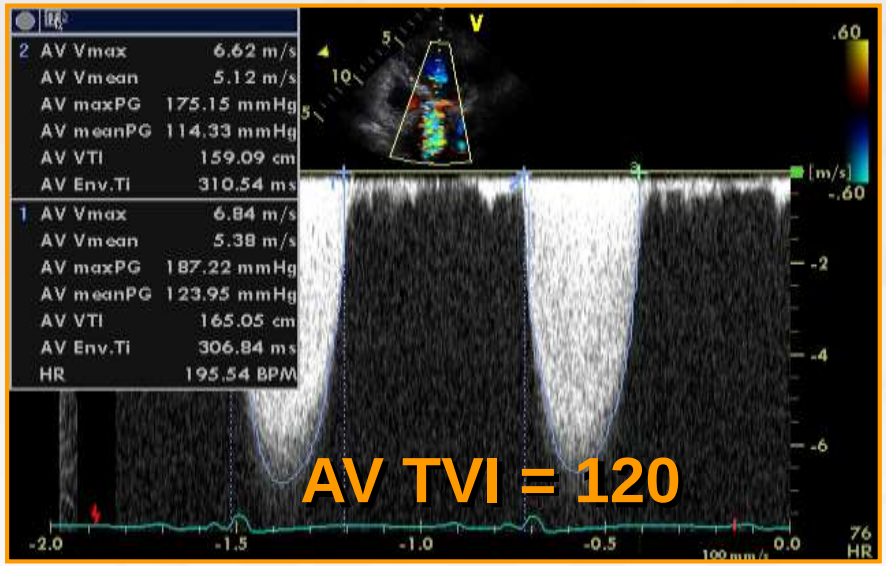
The Role of TTE and TEE for TAVR

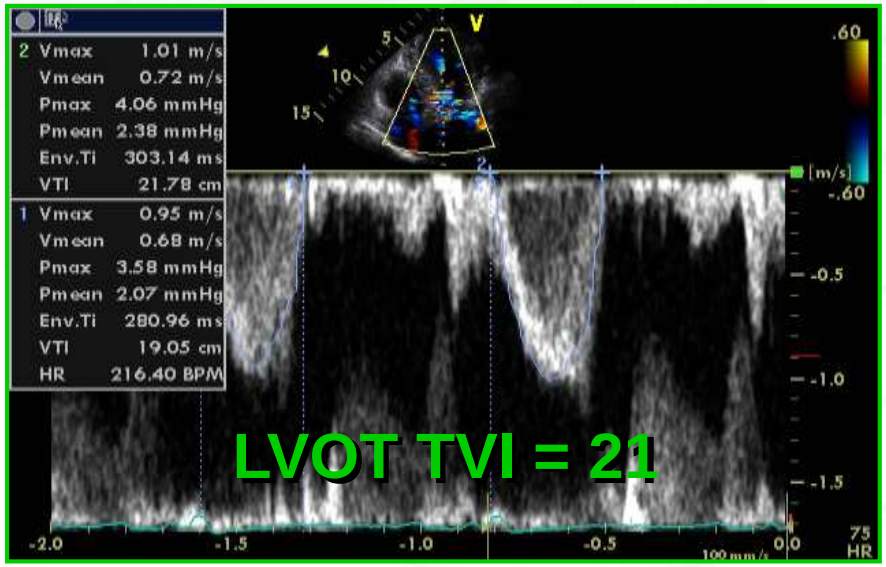
Dae-Hee Kim
Asan Medical Center
Ulsan college of Medicine

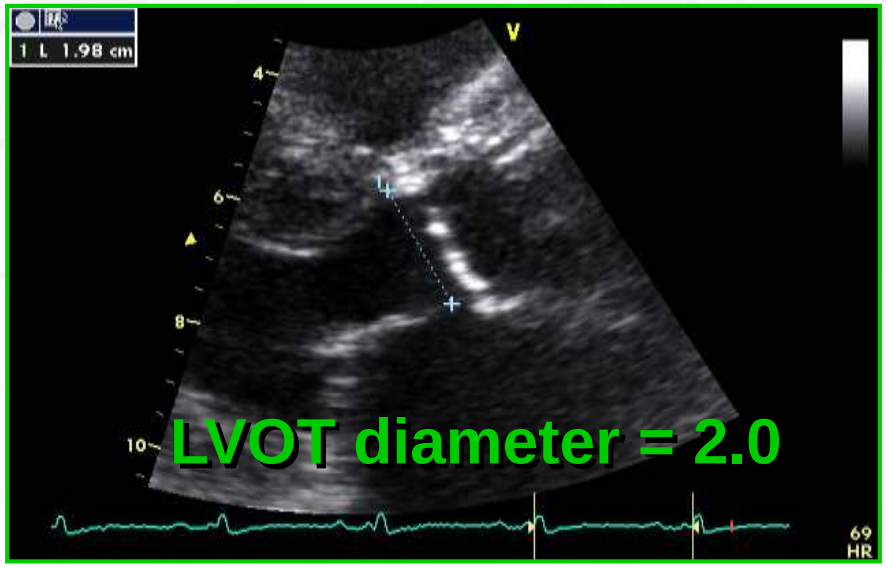
Diagnosis of severe aortic stenosis



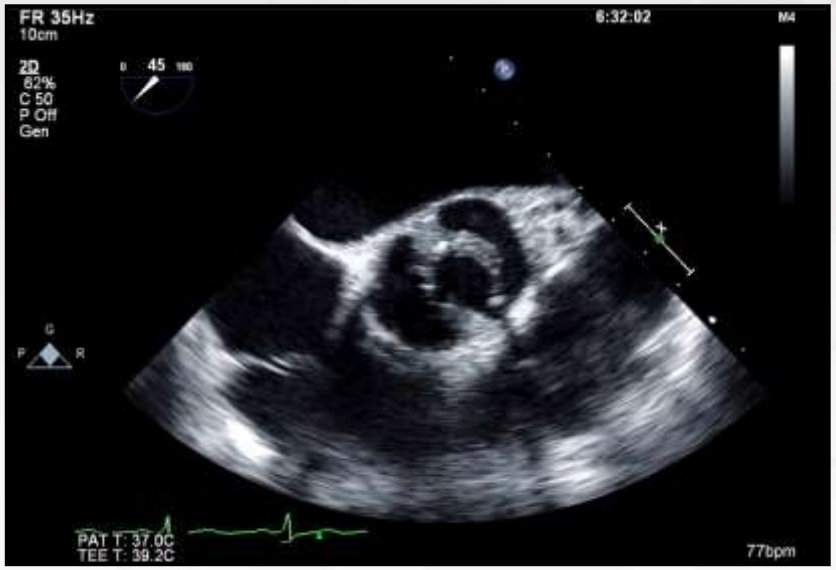
$$AVA = \frac{0.785 \times (2.0)^2 \times 21}{120}$$

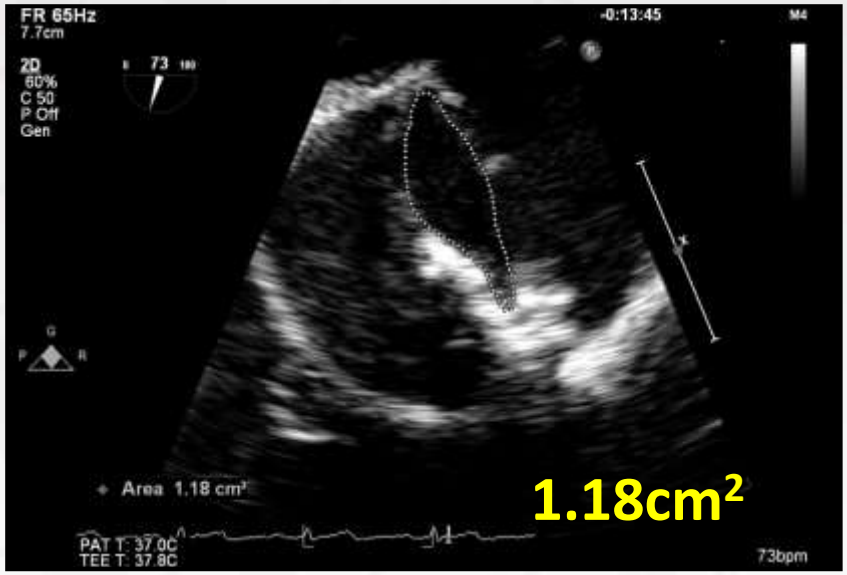
$$= 0.55\ cm^2$$

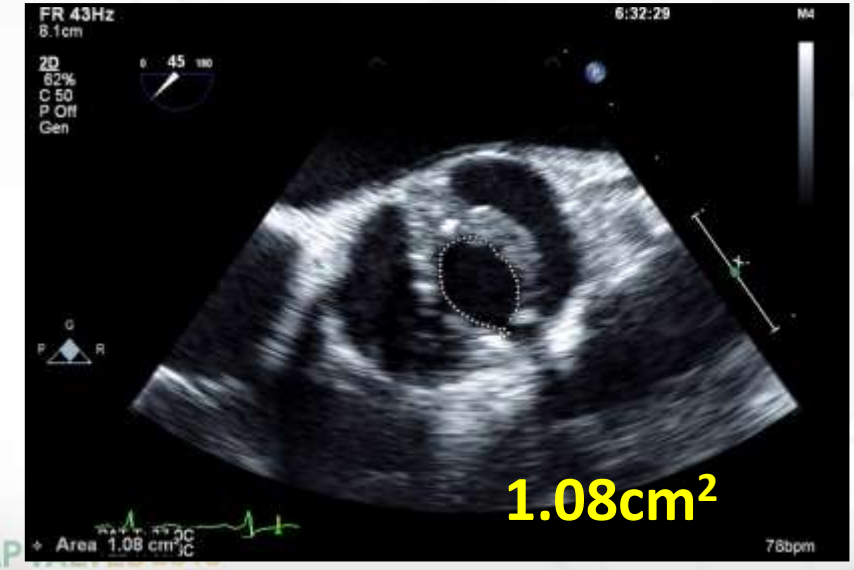


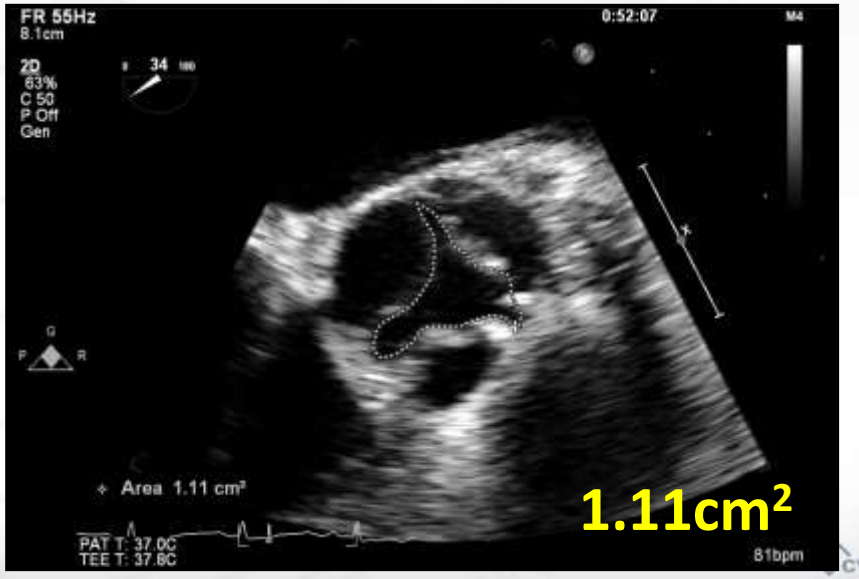


2D Planimetry for AS

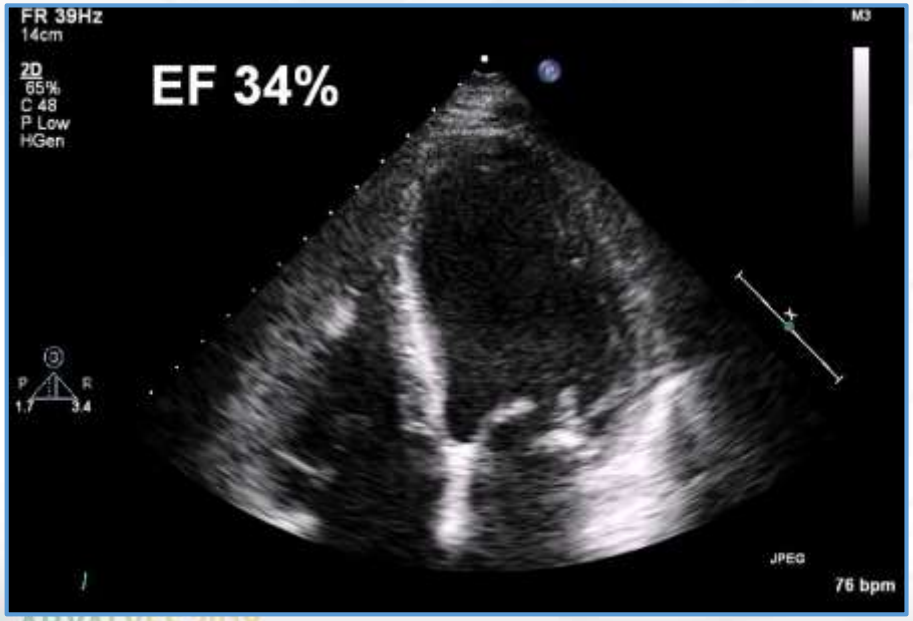




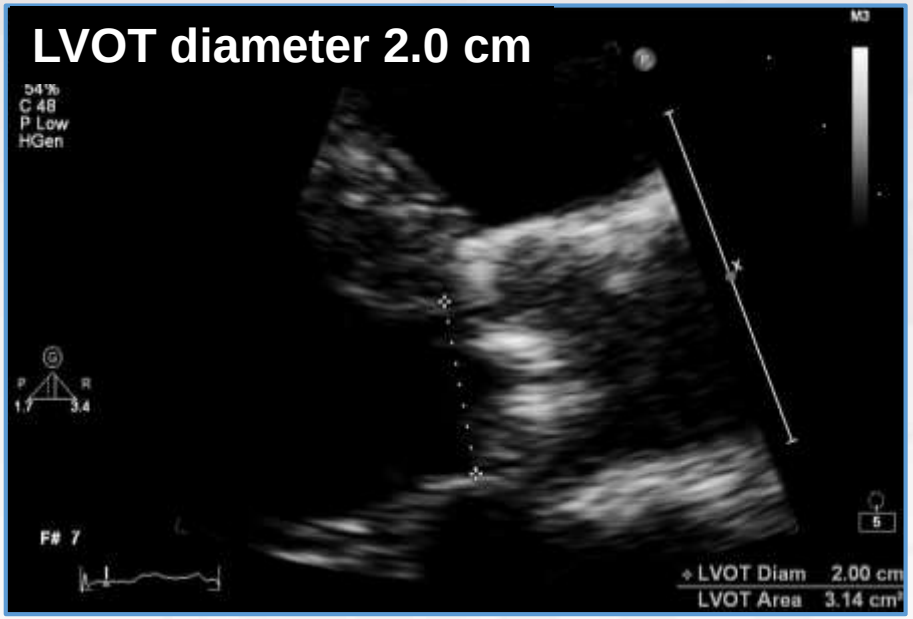


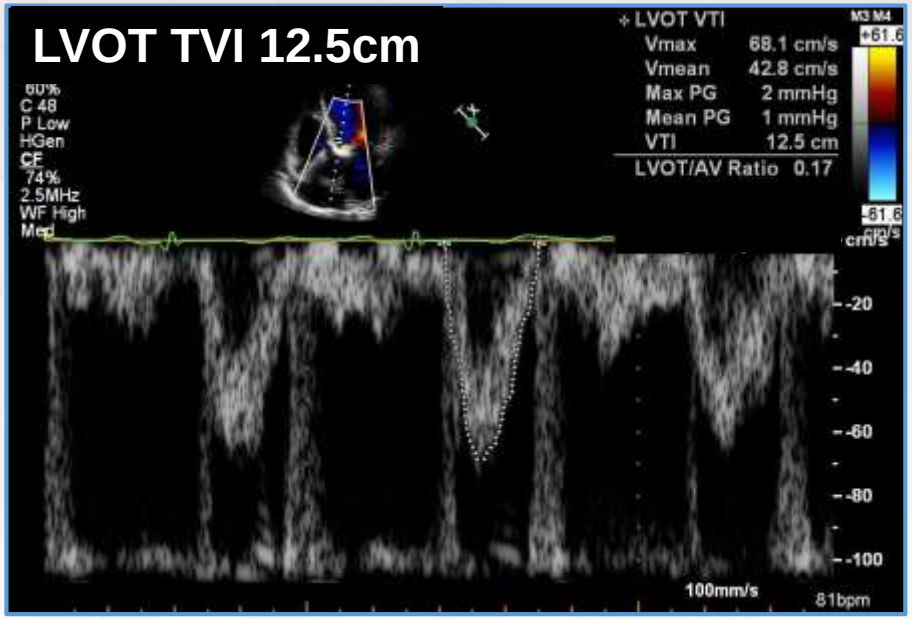


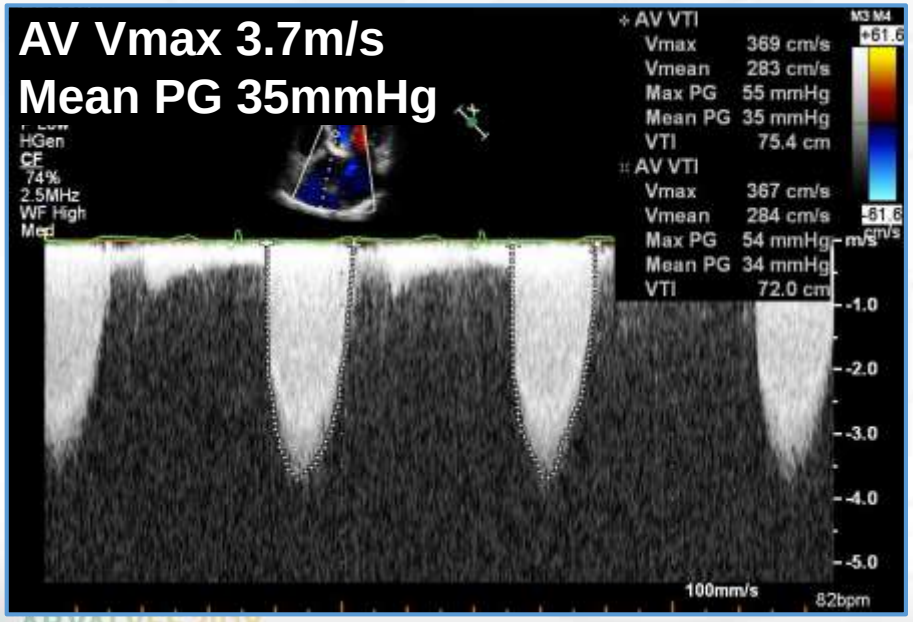
Case: low-flow, low-gradient AS with depressed LVEF



Case: low-flow, low-gradient AS with depressed LVEF







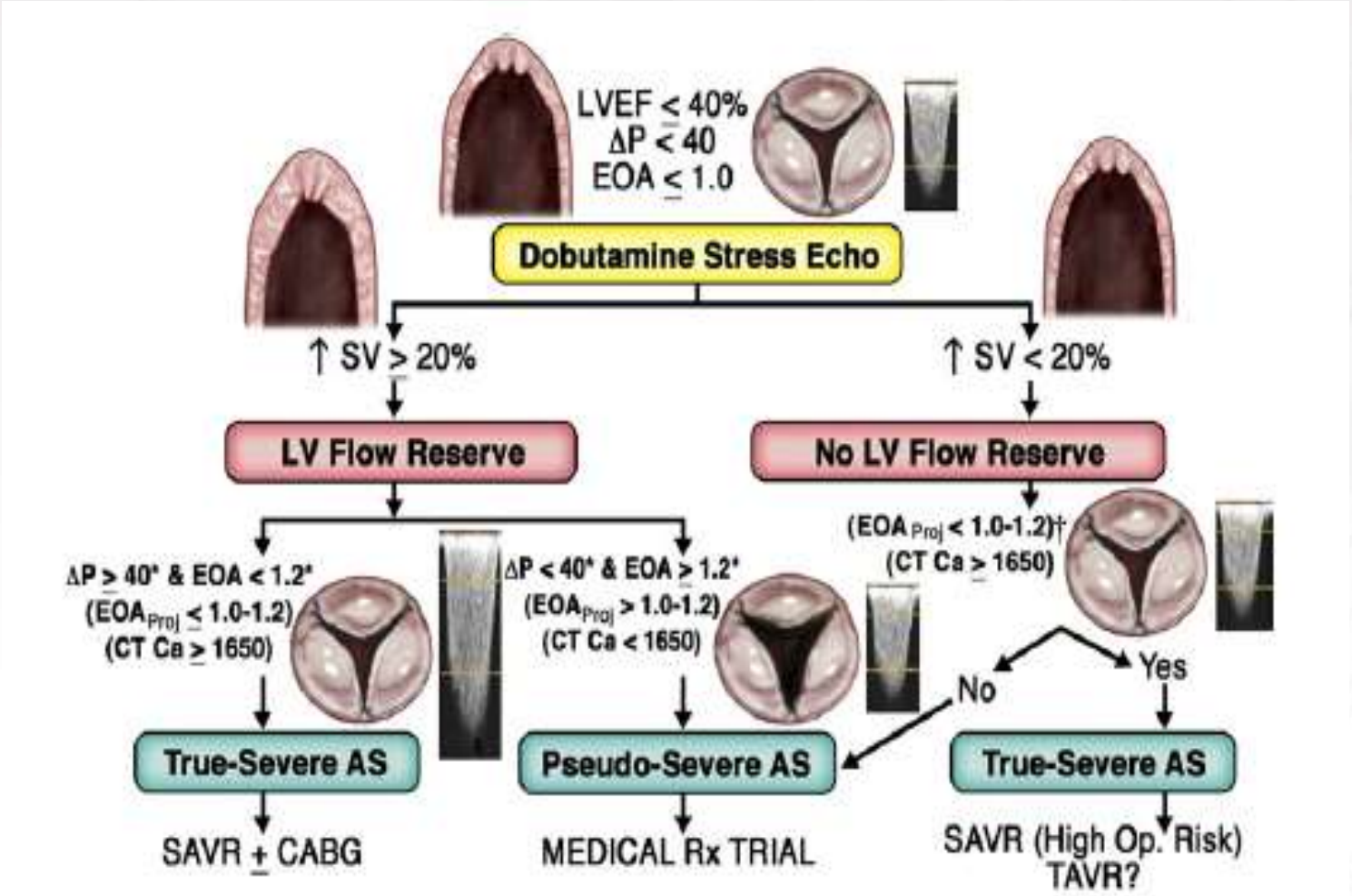
$$SV = 36ml$$

$$AVA = \frac{0.785 \times (LVOT\ D)^2 \times LVOT\ TVI}{AV\ TVI}$$

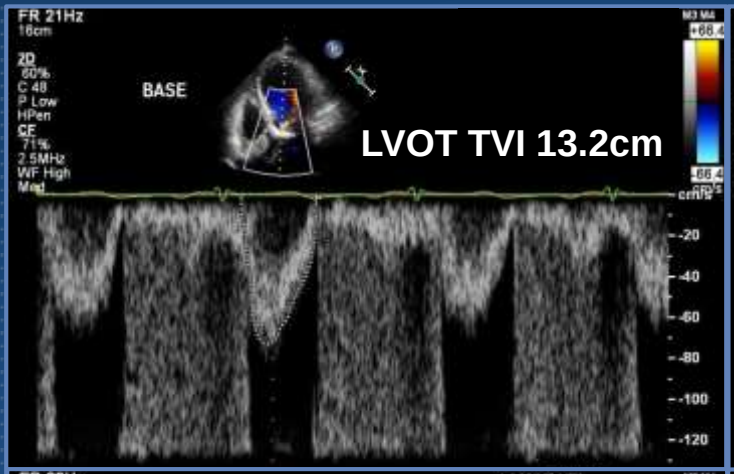
$$\frac{0.785 \times (2.0)^2 \times 12.5}{73.7}$$

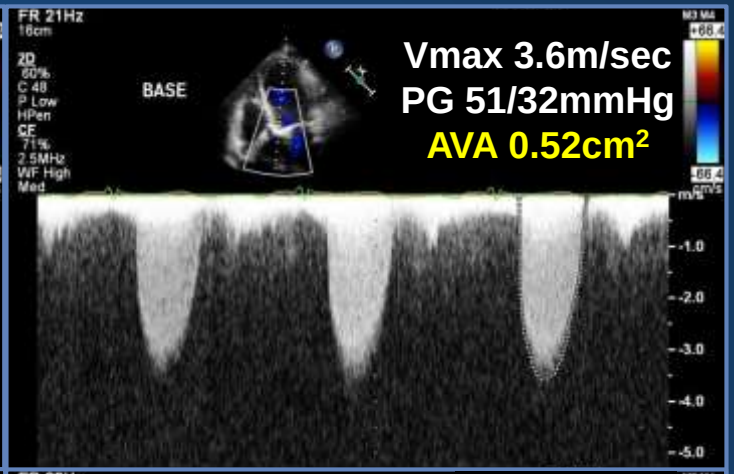
$$= 0.53\ cm^2$$

Low-Gradient AS with Depressed LVEF

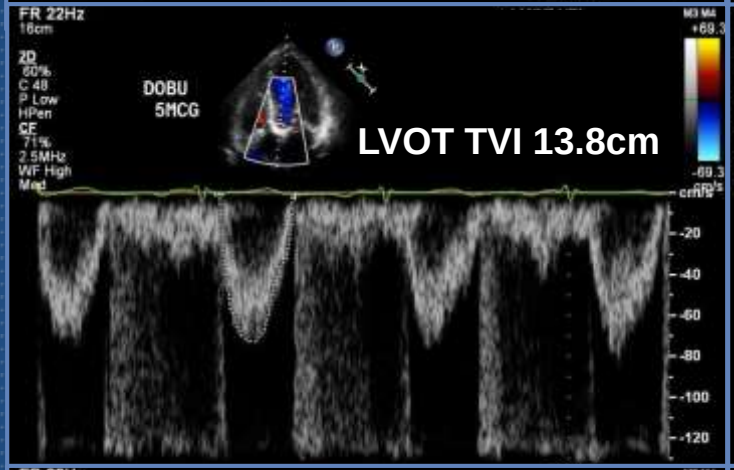


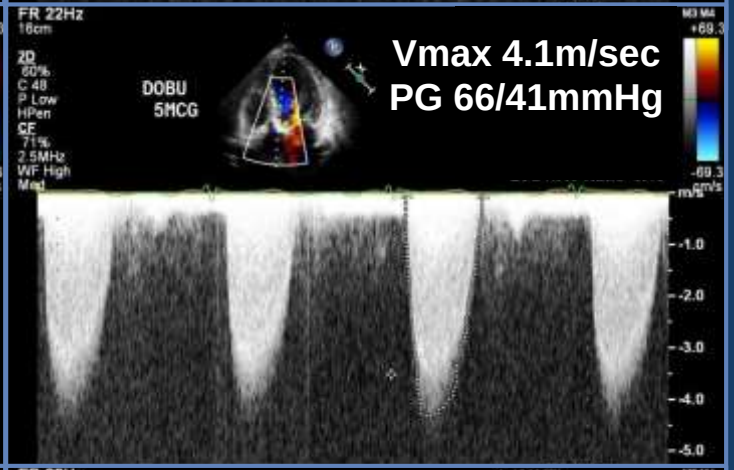
Baseline



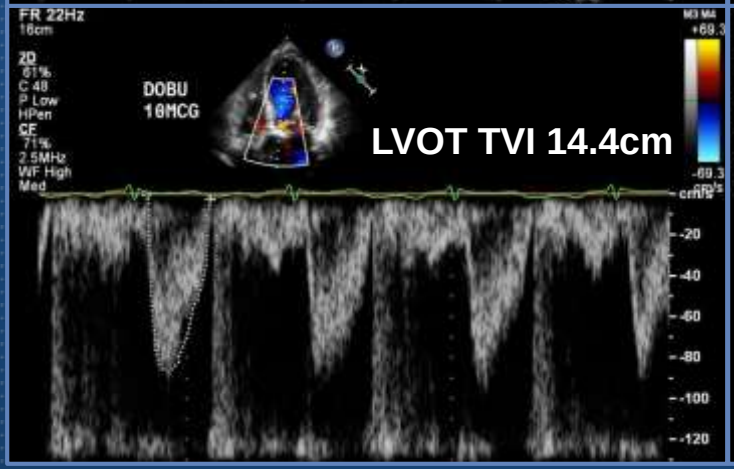


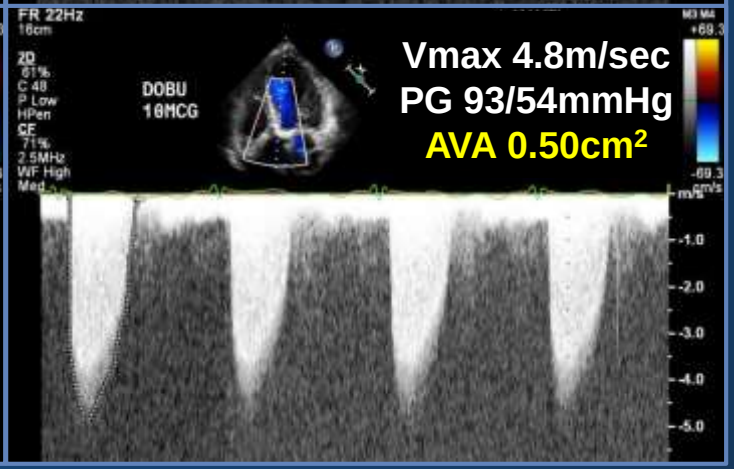
Dobu 5μg



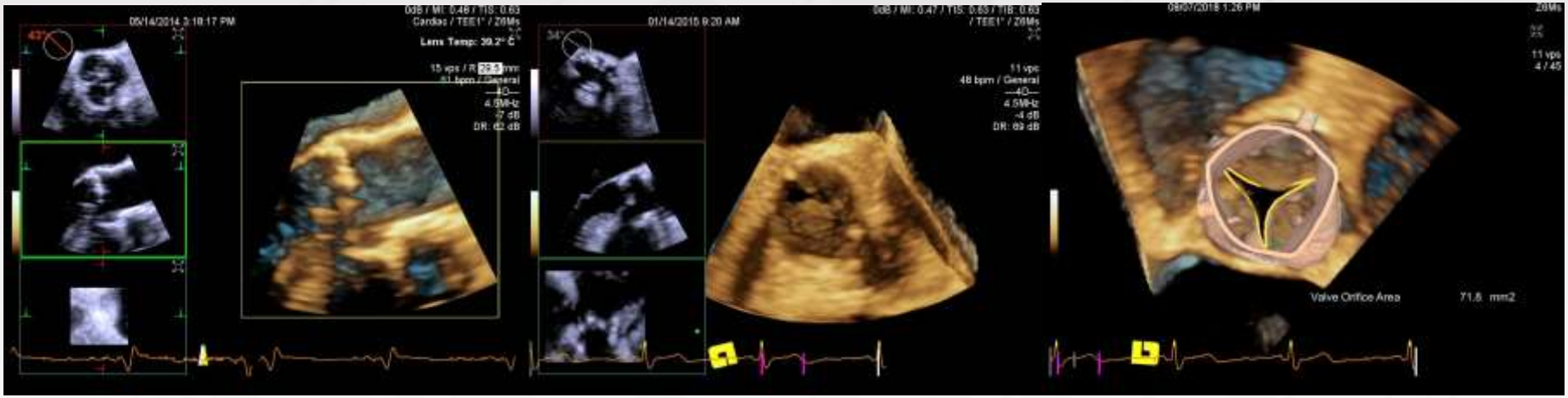


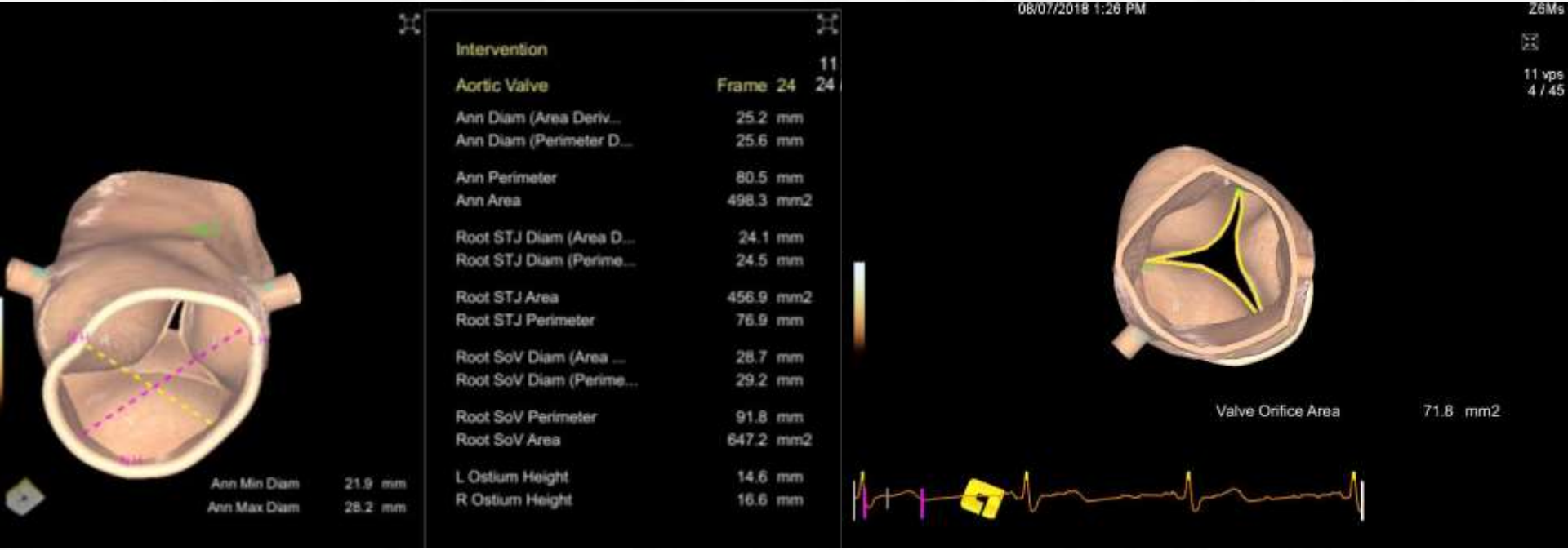
Dobu 10μg





Preprocedural planning





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Case Report

Check for updates

Contrast-free (Zero-contrast) TAVR for Severe Aortic Stenosis in Patient with Chronic Kidney Disease

Yeon-Jik Choi, Chul-Min Ahn, Da-Rae Kim, Geu-Ru Hong, Young-Guk Ko, Myeong-Ki Hong

Division of Cardiology, Department of Internal Medicine, Severance Cardiovascular Hospital, Yonsei University College of Medicine, Seoul, Korea

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Correspondence to
Myeong-Ki Hong
Division of Cardiology, Department of Internal Medicine, Severance Cardiovascular Hospital, Yonsei University College of Medicine, 50 Yonsei-ro, Seodaemun-gu, Seoul 03722, Korea.
E-mail: MKHONG61@yuhs.ac

ABSTRACT

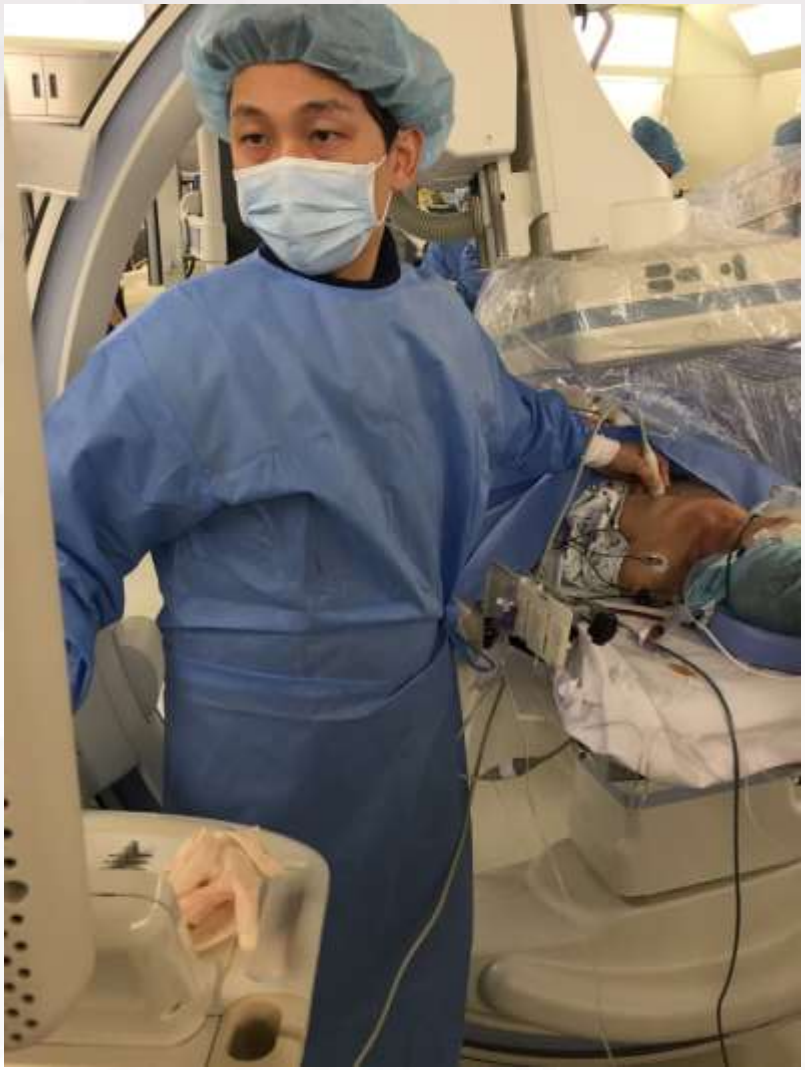
Transcatheter aortic valve replacement (TAVR) or transcatheter aortic valve implantation (TAVI) for severe aortic stenosis (AS) is a minimally invasive interventional procedure that repairs a valve without removing the old, damaged valve. Instead, a replacement valve is wedged into the location of the native aortic valve. During TAVR, contrast is used for conventional aortic root angiography, positioning of the TAVR valve device, and assessing the peripheral vasculature. Therefore, contrast-induced acute kidney injury (AKI) is a major concern when performing TAVR and is associated with increased mortality in patients with impaired renal function. Although the exact mechanism of post-TAVR AKI is unknown and appears multifactorial, contrast medium has been reported as a major contributing factor. We report a case of zero-contrast TAVR for severe AS in a patient with chronic kidney disease (CKD). The procedure was successfully performed with only fluoroscopic and transesophageal echocardiography (TEE) guidance.

Keywords: Transcatheter aortic valve replacement; Acute kidney injury; Chronic kidney diseases; Aortic stenosis

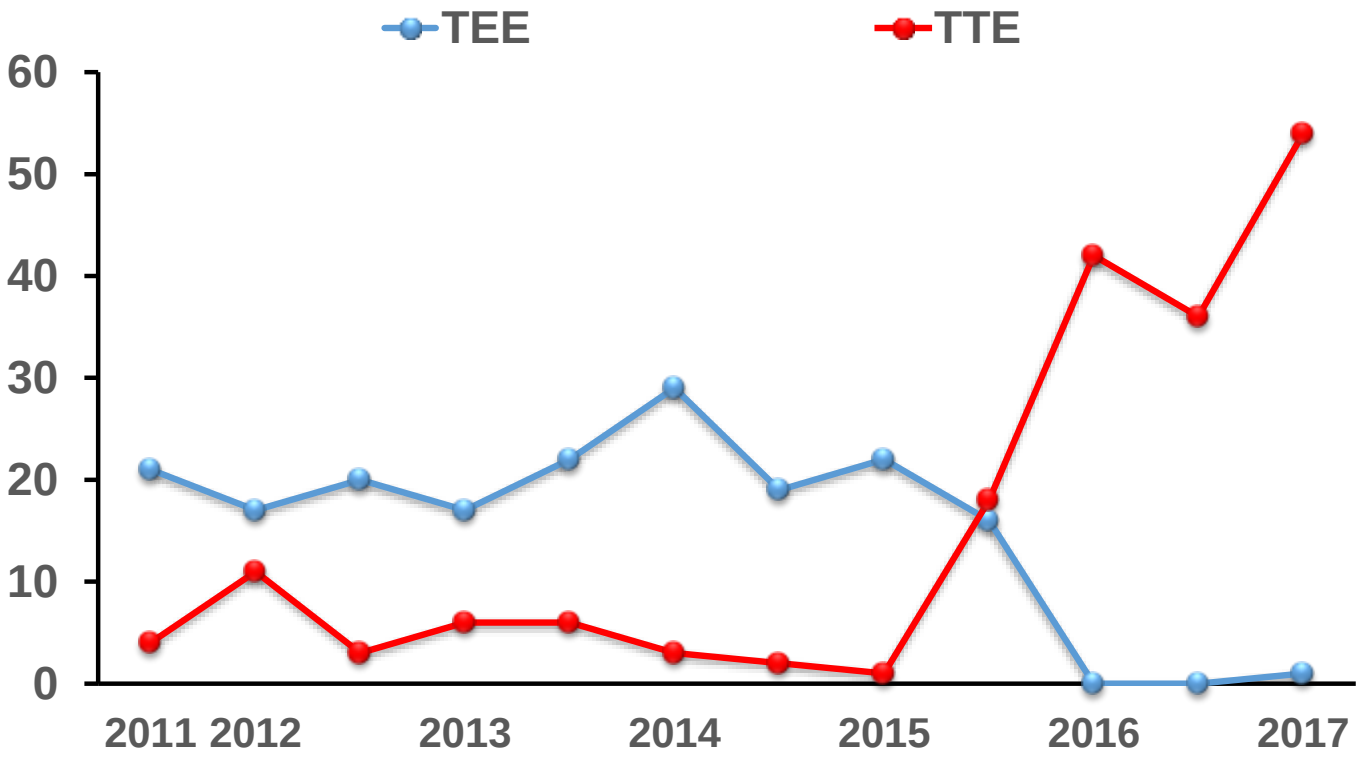
Procedural guidance TTE vs. TEE?

- **Current Practice**

  - TEE is very useful for the learning curve and early experience (50-70 first patients)
  - Disadvantage of TEE: requires general sedation (own risks)
  - Most experienced teams don’t use systematic TEE anymore



“Minimalist Approach”
TAVR in AMC



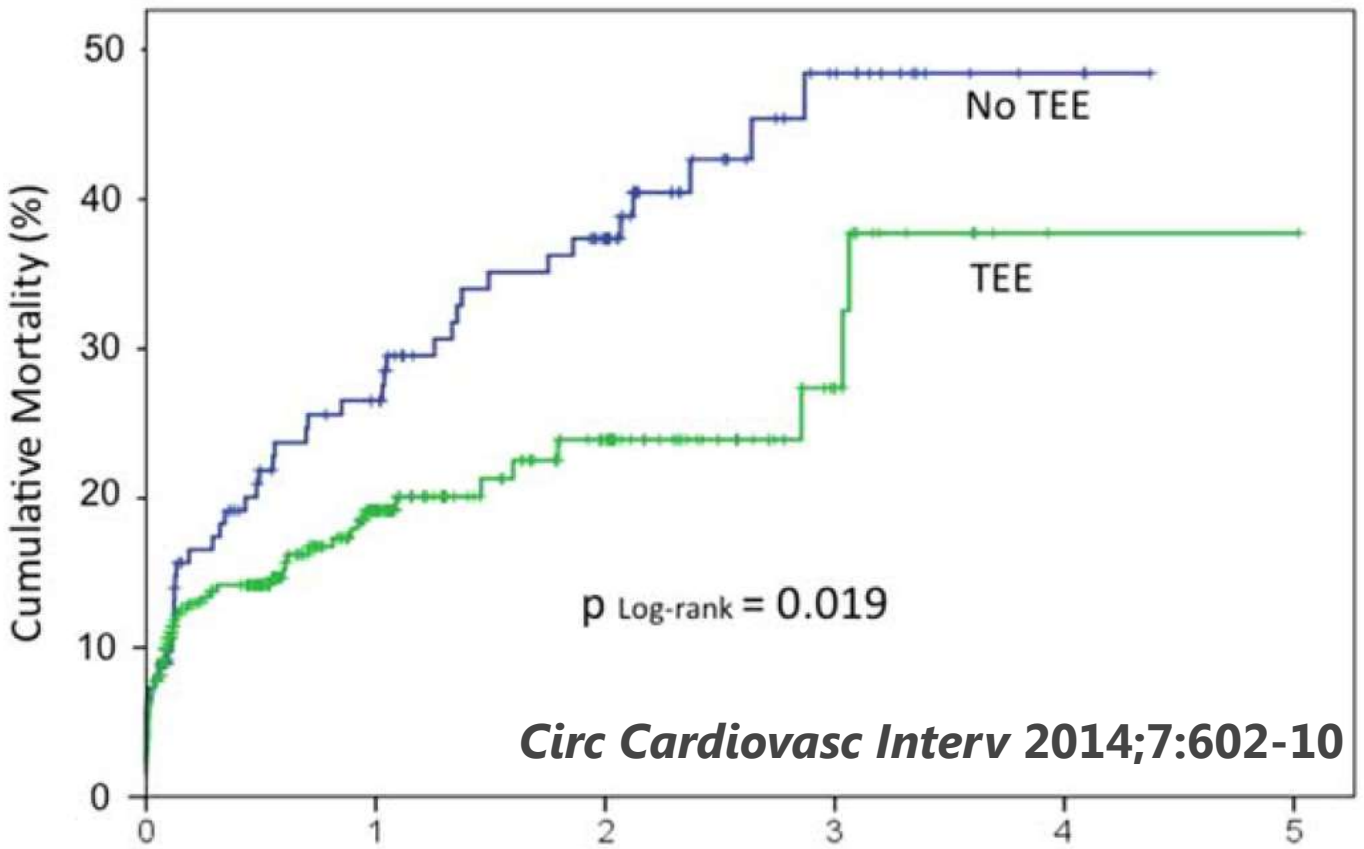
TTE Versus TEE in TAVR Guidance

Parameter	TTE	TEE
Sedation During TAVR	•None required (sedation for procedure only)	•General anesthesia, monitored anesthetic care, or conscious sedation
Imaging Advantages	•Standard windows for assessing ventricular and valvular structure and function	•Higher resolution with high frame rates for two-dimensional and three-dimensional imaging •Continuous imaging throughout procedure irrespective of access route •Preprocedural imaging may avoid complications (i.e., PVR, annular/aortic rupture, and coronary occlusion) •Immediate intra-procedural diagnosis of complications

TTE Versus TEE in TAVR Guidance

Parameter	TTE	TEE
Imaging Disadvantages	•Image quality dependent on patient factors (i.e., chest morphology, lung hyperinflation, and suboptimal patient positioning) •Procedural delay during image acquisition (to minimize radiation exposure to imager) •Noncontinuous imaging during procedure •Low resolution with low frame rates for two-dimensional and three-dimensional imaging •Limited imaging windows for nontransfemoral access routes	•Special windows required for assessing ventricular and valvular structure and function •Image quality dependent on patient factors (i.e., calcific acoustic shadowing and cardiac position relative to esophagus and stomach) •Probe interference with fluoroscopic imaging (minimized by articulation of probe)
Other Advantages	•Early recovery and discharge	•Need for postprocedure monitoring (Note: may not be different than for TTE)
Other Disadvantages	•Possible higher radiation exposure to imager •Interference with sterile field	•Trauma to oropharynx, esophagus, or stomach

Result from the Brazilian Registry



Circ Cardiovasc Interv 2014;7:602-10

N. at risk						
TEE	295	116	50	16	1	1
No TEE	123	76	51	15	4	0

Clinical Outcomes and Safety of Transfemoral Aortic Valve Implantation Under General Versus Local Anesthesia

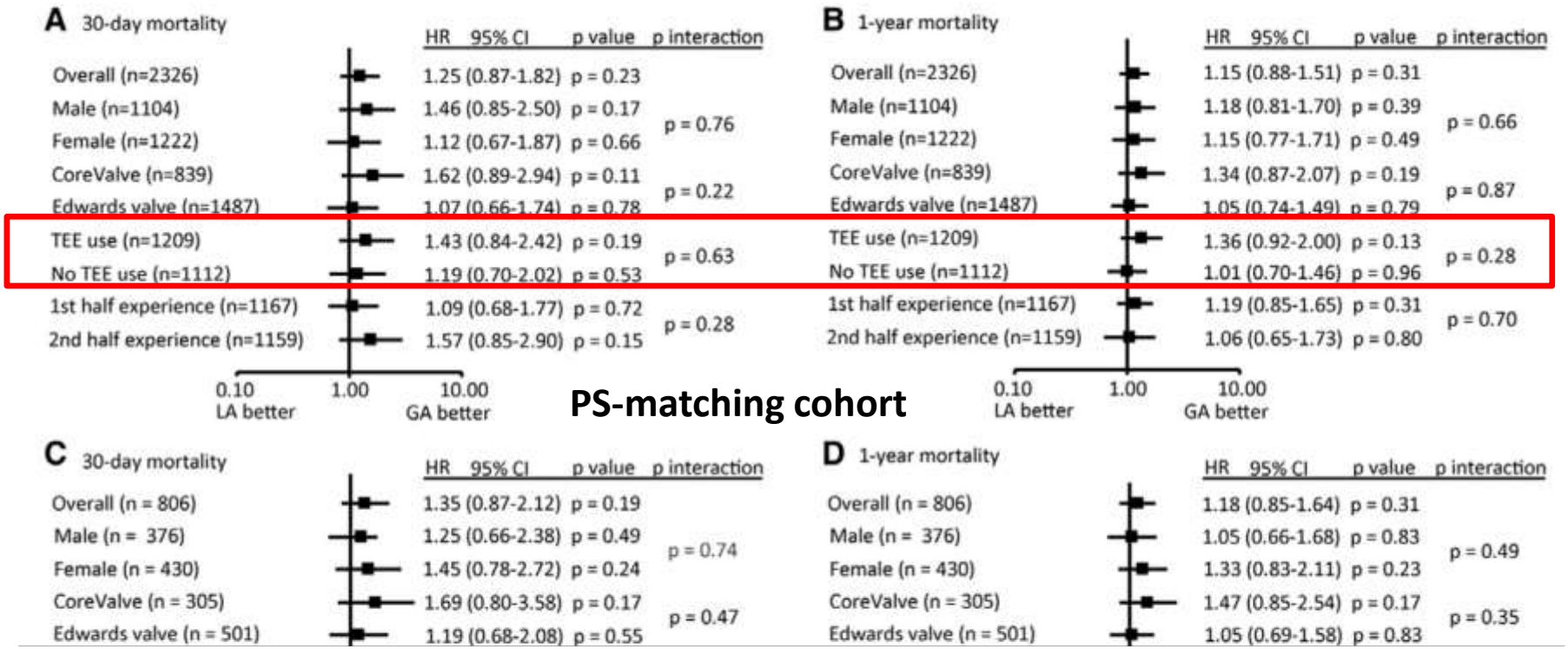
Subanalysis of the French Aortic National CoreValve and Edwards 2 Registry

Atsushi Oguri, MD; Masanori Yamamoto, MD; Gauthier Mouillet, MD; Martine Gilard, MD; Marc Laskar, MD; Helene Eltchaninoff, MD; Jean Fajadet, MD; Bernard Iung, MD; Patrick Donzeau-Gouge, MD; Pascal Leprince, MD; Alain Leguerrier, MD; Alain Prat, MD; Michel Lievre, PhD; Karine Chevreul, MD; Jean-Luc Dubois-Rande, MD; Romain Chopard, MD; Eric Van Belle, MD; Toshiaki Otsuka, MD; Emmanuel Teiger, MD; on behalf of FRANCE 2 Registry Investigators

Background—Transcatheter aortic valve implantation (TAVI) performed under local anesthesia (LA) is becoming increasingly common. We aimed to compare the clinical outcomes in patients who underwent transfemoral-TAVI under general anesthesia (GA) and LA.

Methods and Results—Data from 2326 patients in the French Aortic National CoreValve and Edwards 2 (FRANCE 2) registry who underwent transfemoral-TAVI were analyzed. During the study period, the percentage of LA procedures increased gradually from 14% in January 2010 to 59% in October 2011. The clinical outcomes for GA (n=1377) and LA (n=949) were compared. Numerous baseline characteristics differed between the 2 groups, and the use of transesophageal echocardiographic guidance was more common in GA than in LA (76.3% versus 16.9%; $P<0.001$). Device success and cumulative 30-day survival rates were similar in the 2 groups (97.6% versus 97.0%; $P=0.41$ and 91.6% versus 91.3%; $P=0.69$, respectively), whereas the incidence of postprocedural aortic regurgitation≥mild was significantly lower in GA than in LA (15.0% versus 19.1%; $P=0.015$). The groups were also analyzed using a propensity-matching model, including transesophageal echocardiographic usage (GA [n=401] versus LA [n=401]). This model indicated that there were no significant differences between the 2 groups in the rates of 30-day survival (GA [91.4%] versus LA [89.3%]; $P=0.27$] and postprocedural aortic regurgitation≥mild (GA [12.7%] versus LA [16.2%]; $P=0.19$).

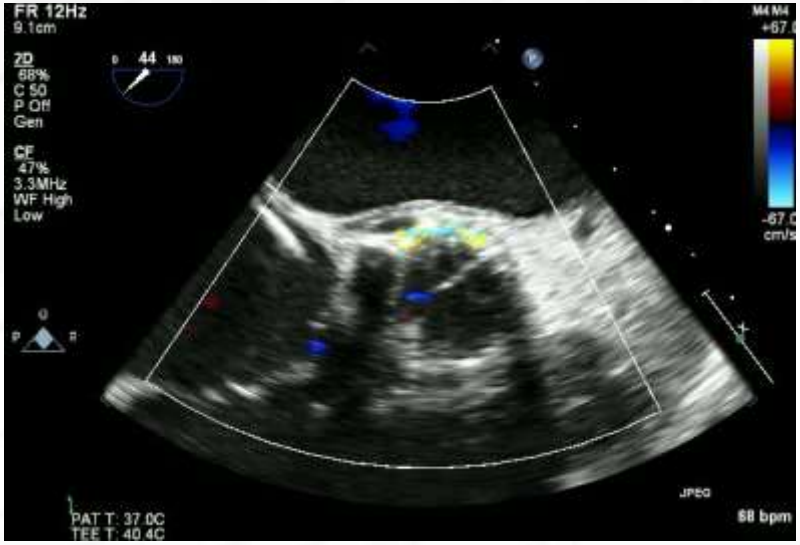
Conclusions—The less invasive transfemoral-TAVI under LA is preferred in clinical settings and seems to be acceptable; however, the higher incidence of postprocedural aortic regurgitation is emphasized. Therapeutic efforts should be made to reduce such complications during transfemoral-TAVI under LA. (***Circ Cardiovasc Interv*. 2014;7:602-610.**)



PS-matching cohort

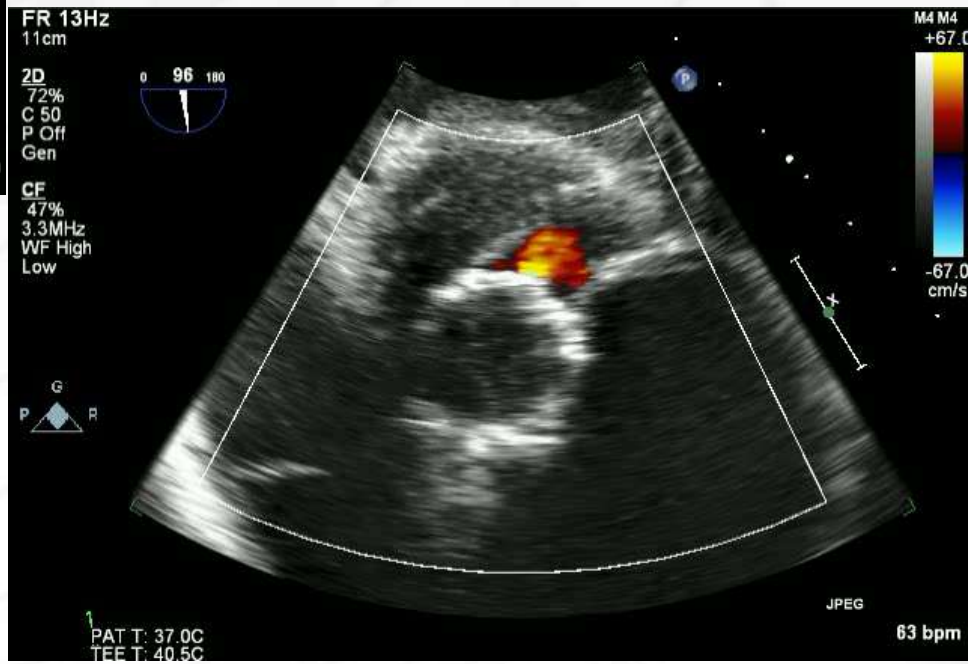
echocardiographic guidance was more common in GA than in LA (76.3% versus 16.9%; $P<0.001$). Device success and cumulative 30-day survival rates were similar in the 2 groups (97.6% versus 97.0%; $P=0.41$ and 91.6% versus 91.3%; $P=0.69$, respectively), whereas the incidence of postprocedural aortic regurgitation≥mild was significantly lower in GA than in LA (15.0% versus 19.1%; $P=0.015$). The groups were also analyzed using a propensity-matching model, including transesophageal echocardiographic usage (GA [n=401] versus LA [n=401]). This model indicated that there were no significant differences between the 2 groups in the rates of 30-day survival (GA [91.4%] versus LA [89.3%]; $P=0.27$] and postprocedural aortic regurgitation≥mild (GA [12.7%] versus LA [16.2%]; $P=0.19$).

Assessment of PVL during the procedure



Assessment of PVL during the procedure

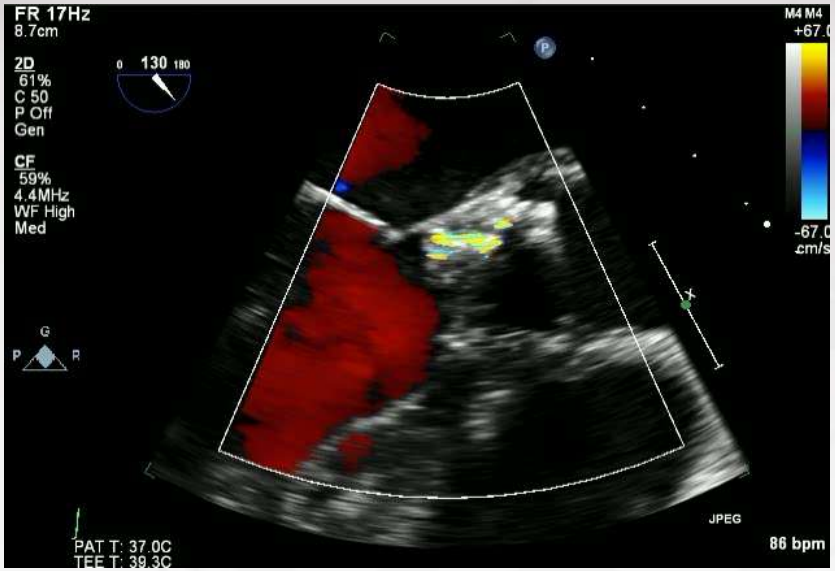
Importance of deep gastric view

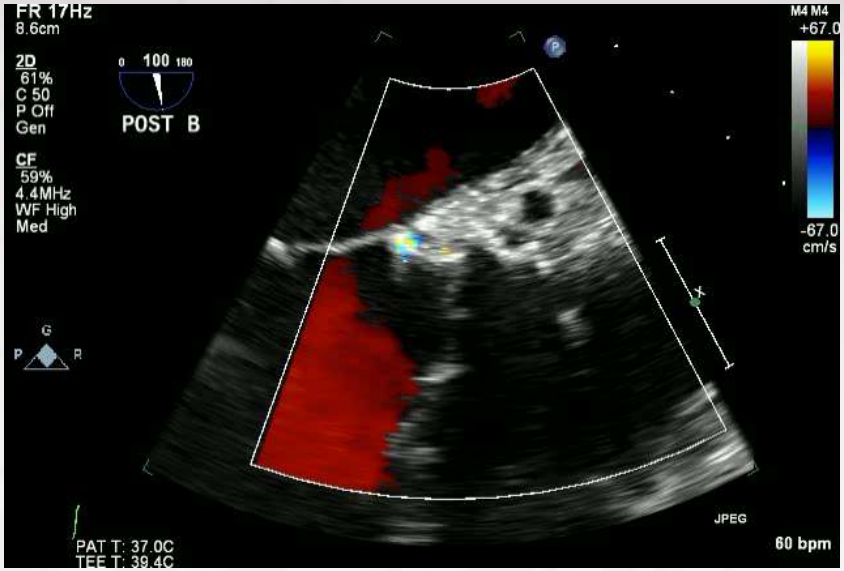


Procedural complications : Troubleshooting with Echo

- **Severe hypotension during the procedure = life-thre atening emergency: Rapid diagnosis is key ++**

- **TTE should be readily available to rule out:**
  - Severe AR due to incomplete deployment (calcification) or
  - Malposition of the prosthesis (in the LVOT)
  - Aortic annulus rupture, coronary obstruction secondary to displaced aortic cusp or bulky calcium
  - Cardiac tamponade due to right ventricular (pacing wire) or left ventricular (stiff guidewire) perforation
  - **Sometimes, TEE is needed: TEE on demand !!**
  - **Other potential causes :** Retroperitoneal bleeding (injury to a ortoiliac arteries) or transient hypotension due to myocardial st unning (rapid pacing)





After post-ballooning

A Systematic Approach to Follow-Up of TAV

Visual Appearance

- Stent position
- Cusp mobility, thickness
- Color Doppler

Normal

TAV malposition

Hemodynamics

- PG (peak, mean)
- EOA, EOAi
- Regurgitation

TAV thrombus

TAV obstruction

TAV PPM

Regurgitation

Other structure

- MV, aorta, coronaries

MV impingement

Aortic hematoma/dissection

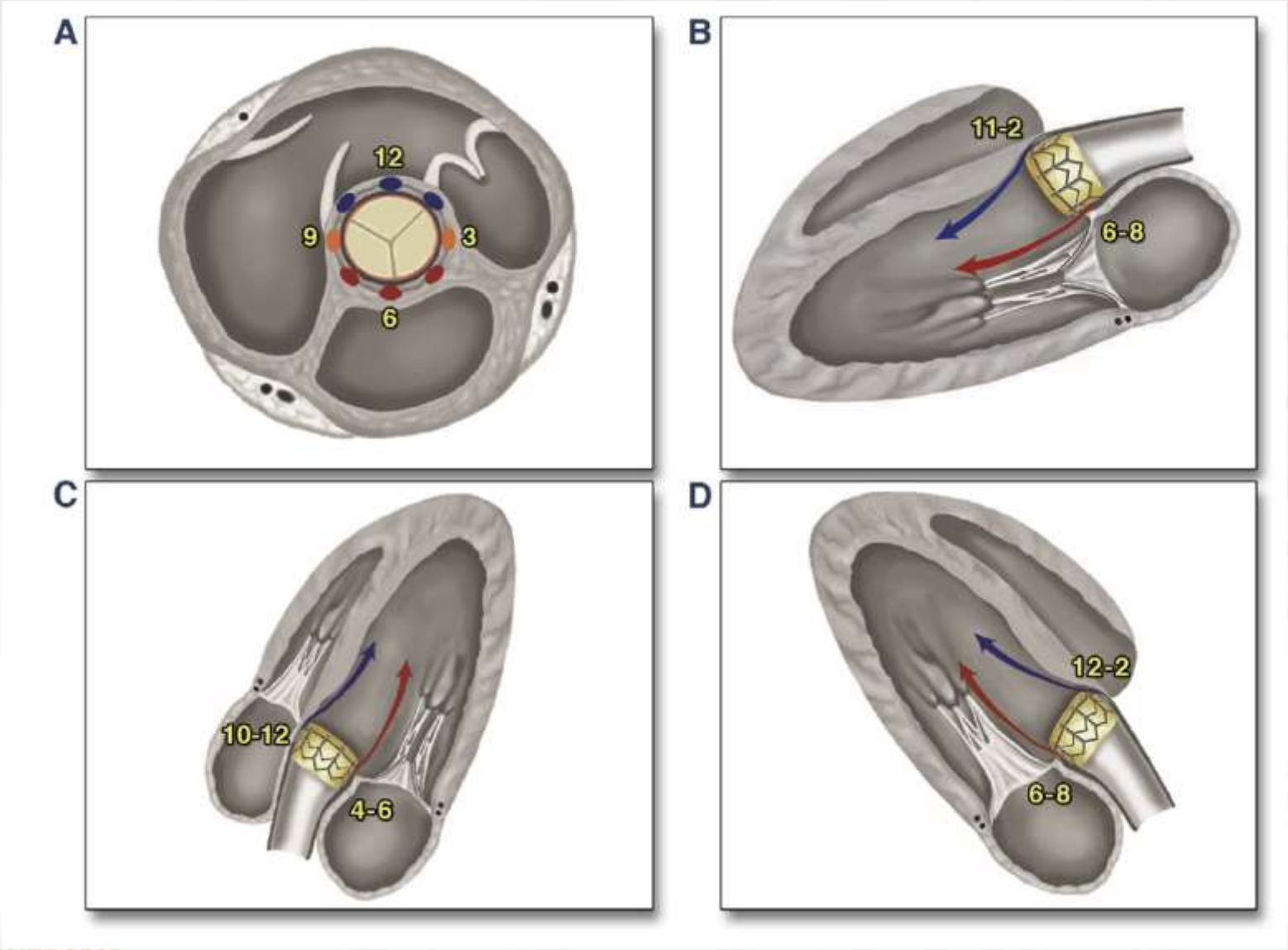
Coronary obstruction

Cardiac function

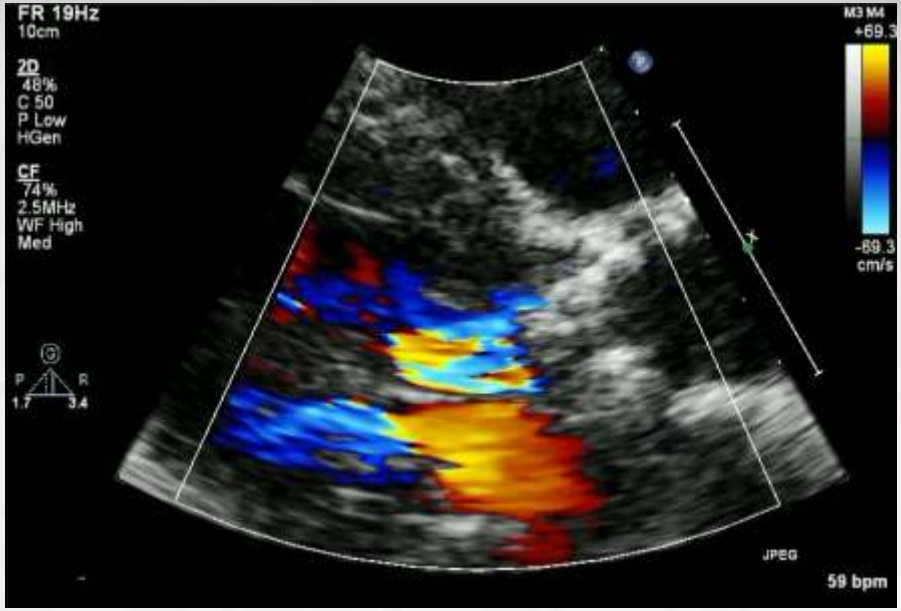
- LV, RV function

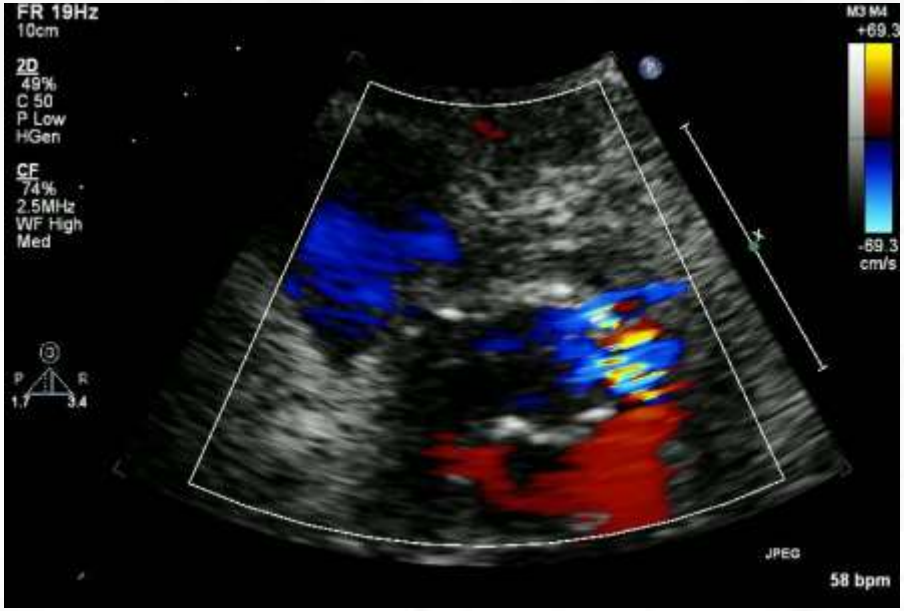
Post-TAVR follow-up

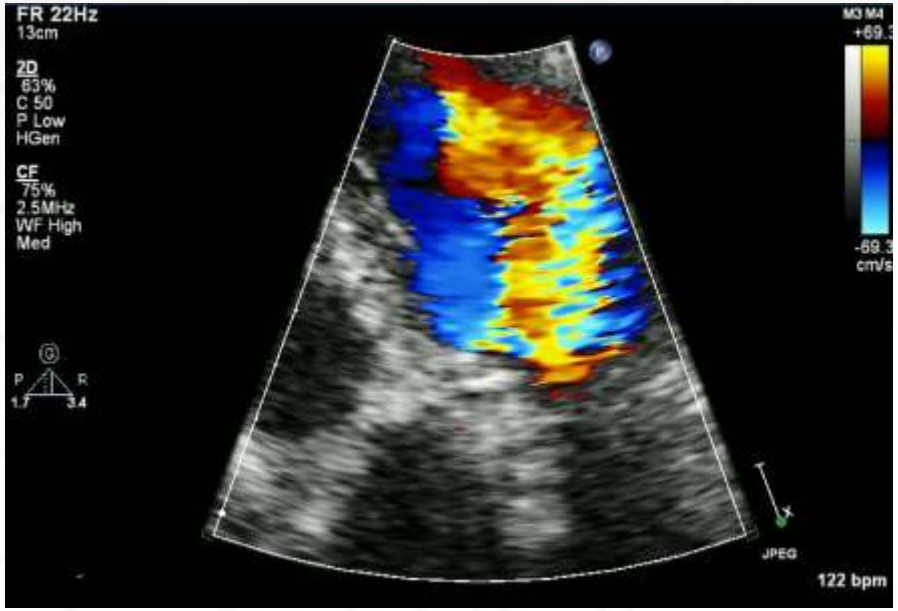
Location of the PVR Jets in the Different TTE Views

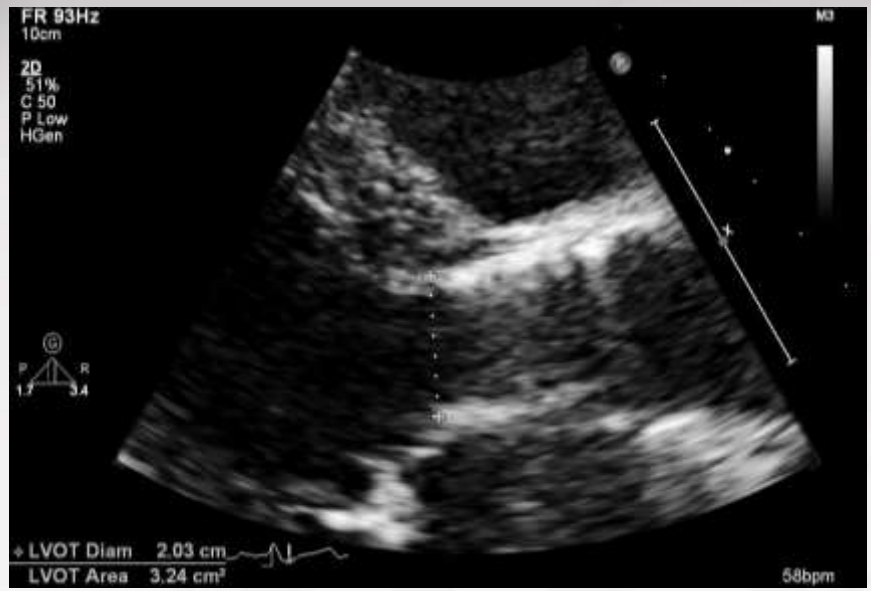


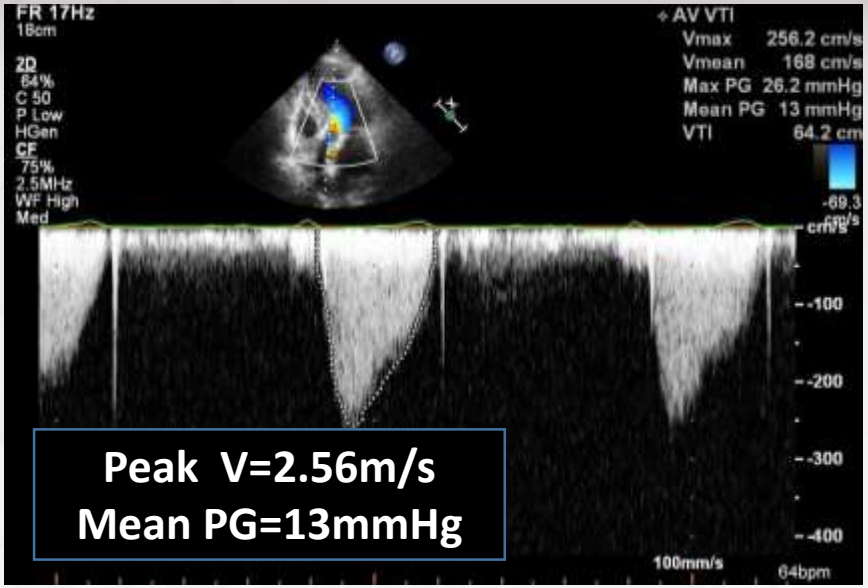

FR 78Hz
12cm
2D
51%
C 50
P Low
HGen
M3
JPEG
57 bpm

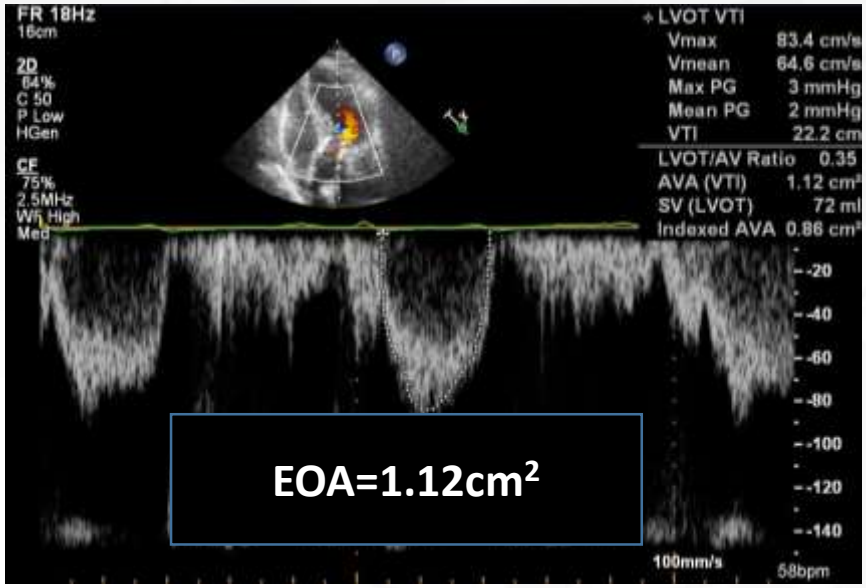

FR 19Hz
10cm
2D
48%
C 50
P Low
HGen
CF
74%
2.5MHz
WF High
Med
M3 M4
-69.3
cm/s
JPEG
59 bpm

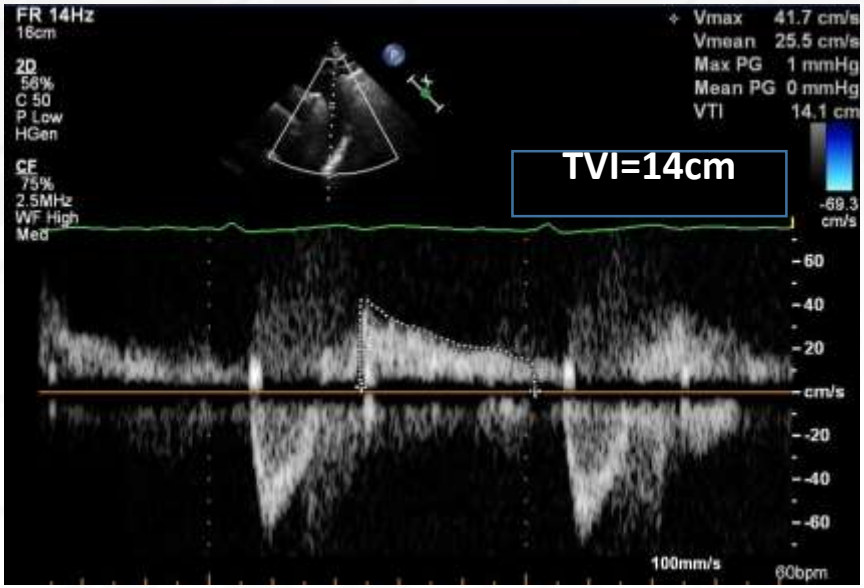

FR 19Hz
10cm
2D
49%
C 50
P Low
HGen
CF
74%
2.5MHz
WF High
Med
M3 M4
-69.3
cm/s
JPEG
58 bpm


FR 22Hz
13cm
2D
63%
C 50
P Low
HGen
CF
75%
2.5MHz
WF High
Med
M3 M4
-69.3
cm/s
JPEG
122 bpm



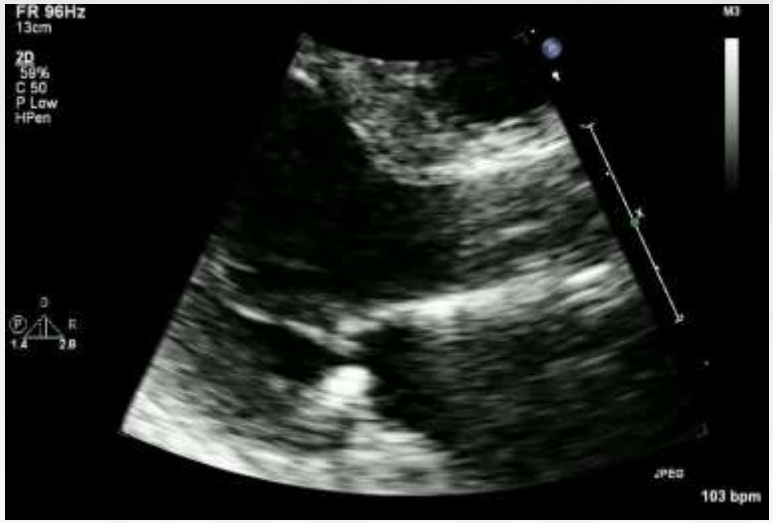


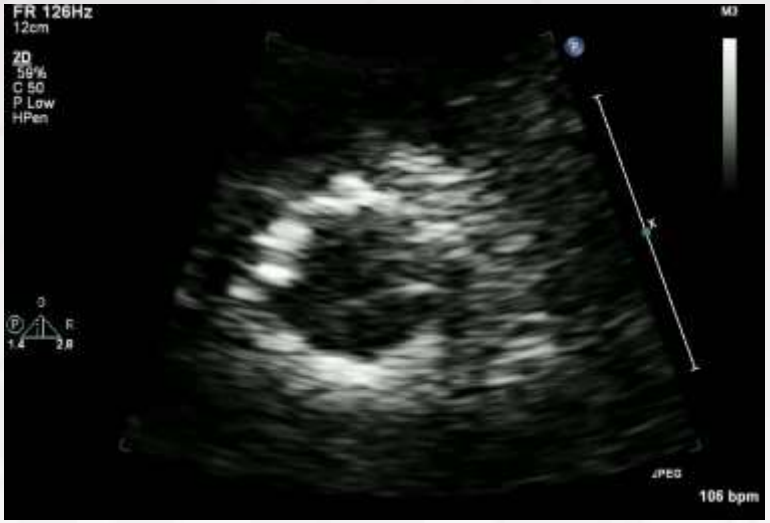


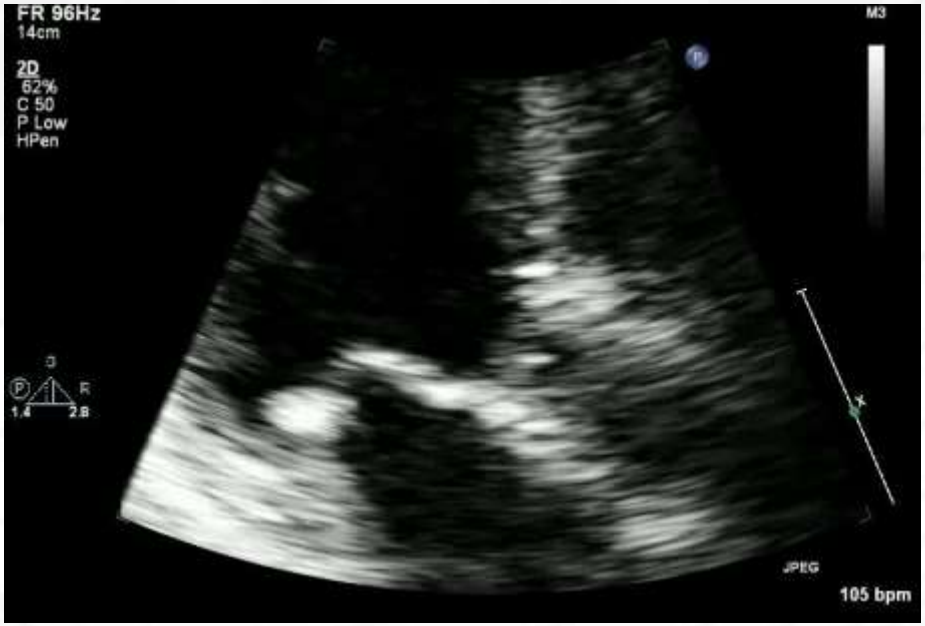


DTA holo-diastolic reversal (+)

Echo imaging in patients with fever







Echo imaging in patients with fever

Summary

The role of TTE and TEE for TAVR

Diagnosis	TTE	+/-	TEE, DSE
Pre-planning	CT	or	3D TEE
Procedure guidance	TEE	→	TTE **TEE on demand**
Post F/U	TTE	+/-	TEE

Thank you for your attention