Pan American Medical Association

Trans Aortic Valve Replacement

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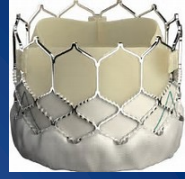


CASE

82 yo male who presents initially with chest pain, DOE and fatigue. Patient has a history of CAD, previous CABG in 1998 and multiple stents. He underwent LCH on March with stent to PDA and was found to have aortic stenosis AVA 1.2cm2.

After PCI the chest pain improved but continued to have DOE and fatigue.

LHC

- 3/2/17 . left main mild, LAD patent stent proximal, 30-40% instent stenosis, circumflex 50-70% stenosis, right coronary artery with severe distal disease, AVA 1.25cm2, mean gradient 22mmHg, LIMA to LAD, SVG to diagonal 100%, SVG to OM 20-30%, SVG to right posterior-lateral 30%, and 99% distal.

Echo in May reports:

Severe aortic valve stenosis.

-Peak aortic velocity is 446.00 cm/s.

-Mean gradient is 41 mmHg.

-Aortic valve area is 0.93 cm2.

-Trace aortic valve regurgitation.

-EF 60-64%

-PMH:

CAD , Dyslipidemia, HTN, AAA, GERD

-Surgeries:

CABG , PTCA, Appendectomy, Cataract, TKR, Bunion Exostectomy, Back surgery.

-Family History

HTN

-Social History:

Quit smoking 50yrs agos, no ETOH, no drugs

-Allergies

NKDA

Physical Exam

Constitutional: well-developed, well-nourished male in no apparent distress.

Head and Face: Normocephalic, atraumatic. **Eyes:** Normal

Ears, Nose, Mouth, and Throat: Oral mucosa moist and pink without pallor or cyanosis. **Neck:** no JVD. No thyromegaly or masses.

Pulmonary: Breath sounds are clear and equal bilaterally.

Cardiovascular: ***murmur was heard, carotid artery bruit, abdominal aorta bruit, but no PMI shift, no hyperdynamic PMI, no thrill, normal brachial pulses, no diminished femoral pulse, normal posterior tibialis pulsed, no upper extremity edema, no lower extremity edema . murmur of AS radiating to neck.***

Abdomen: The Abdomen is soft and nontender with normal bowel sounds. No hepatosplenomegaly.

Musculoskeletal: ambulation requires an assistive device, but normal gait and stance.

Neurologic: Motor and sensory grossly intact, CN II - XII grossly intact.

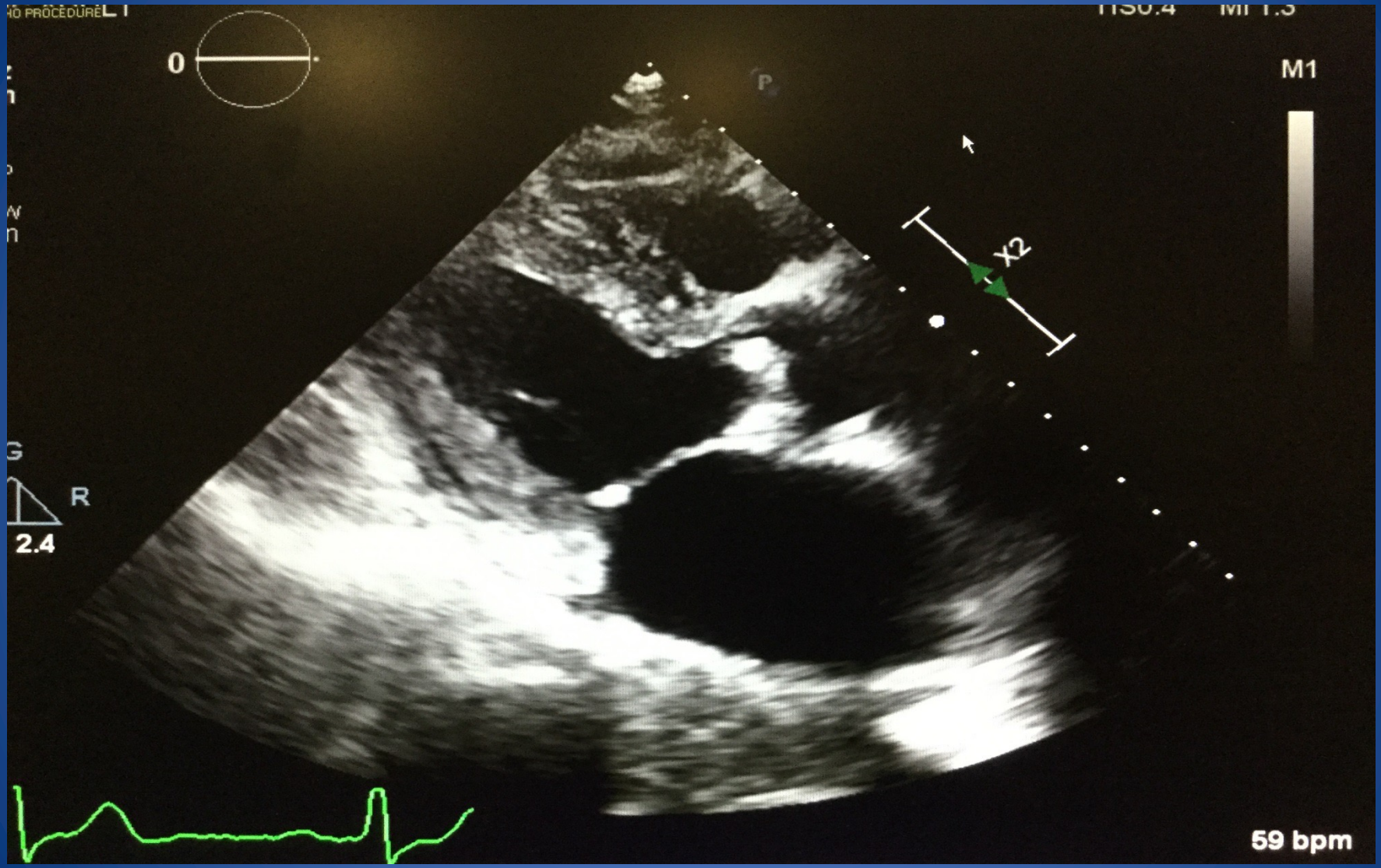
Psychiatric: Oriented to person, place and time. Mood and affect are appropriate.

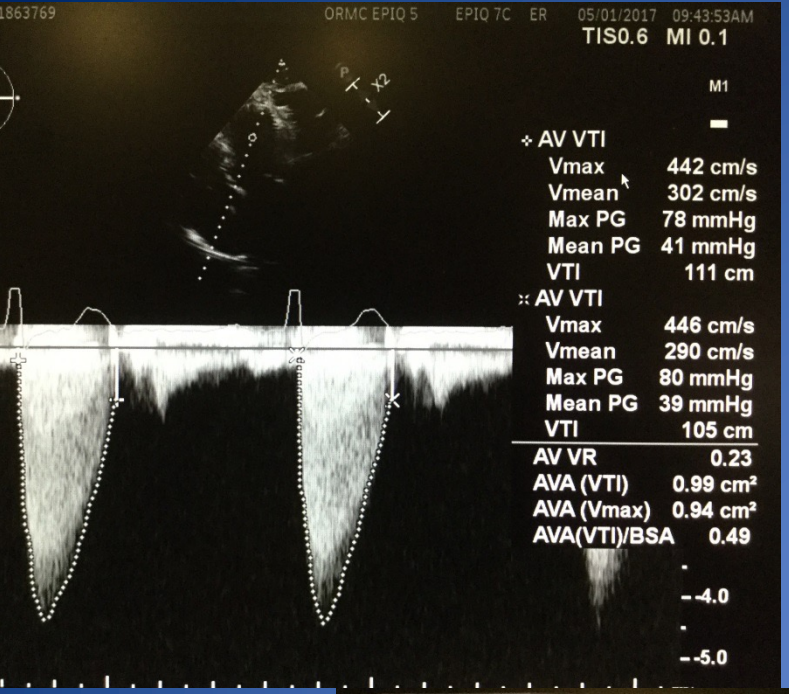
Patient assessment

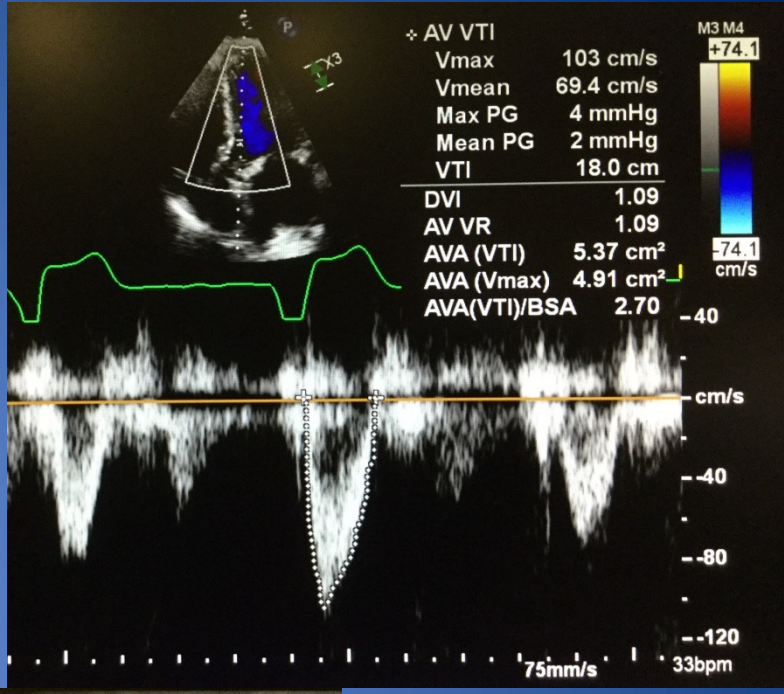
- Severe symptomatic aortic stenosis
- STS 2.143
- Carotid doppler 50-69% b/l ICA stenosis
- High risk of redo sternotomy at his age and Frailty.
- Patient at valve conference deemed an intermediate risk for AVR.

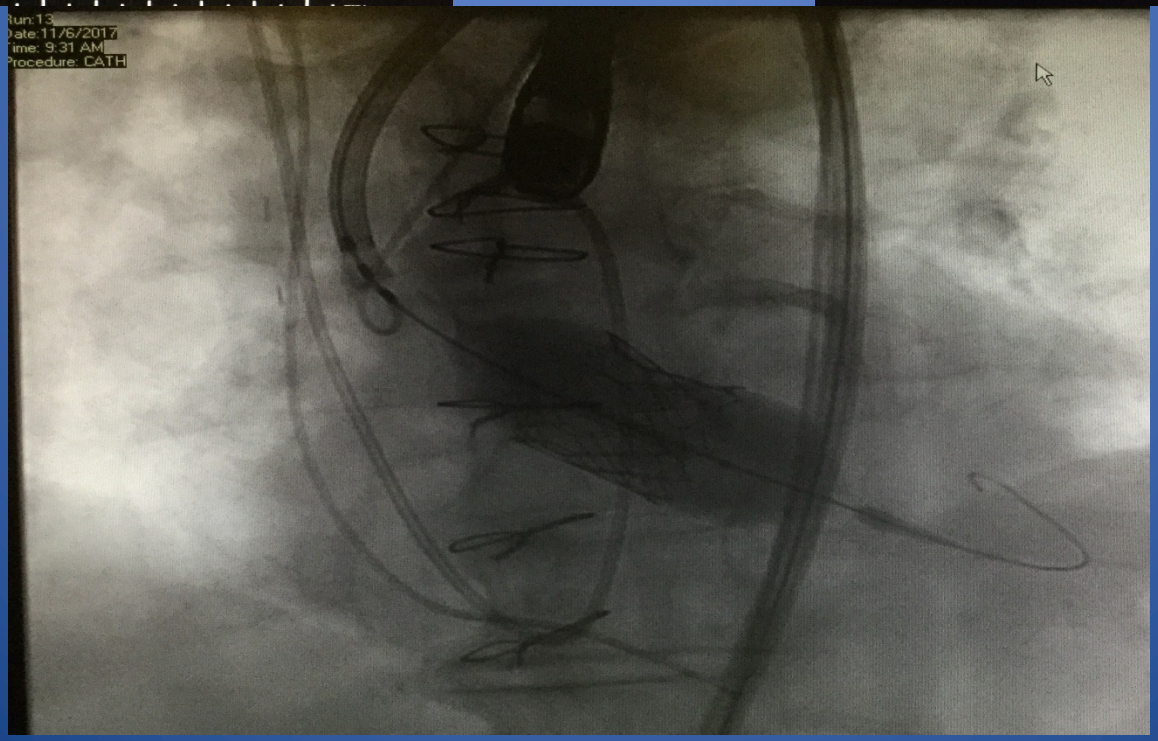
Procedure

- **Transcatheter aortic valve replacement, 29 Sapien 3.**


M1
X2
2.4
59 bpm


1863769
ORMC EPIQ 5
EPIQ 7C
ER
05/01/2017 09:43:53AM
TIS0.6 MI 0.1
M1
AV VTI
Vmax 442 cm/s
Vmean 302 cm/s
Max PG 78 mmHg
Mean PG 41 mmHg
VTI 111 cm
AV VTI
Vmax 446 cm/s
Vmean 290 cm/s
Max PG 80 mmHg
Mean PG 39 mmHg
VTI 105 cm
AV VR 0.23
AVA (VTI) 0.99 cm²
AVA (Vmax) 0.94 cm²
AVA(VTI)/BSA 0.49
-4.0
-5.0


AV VTI
Vmax 103 cm/s
Vmean 69.4 cm/s
Max PG 4 mmHg
Mean PG 2 mmHg
VTI 18.0 cm
DVI 1.09
AV VR 1.09
AVA (VTI) 5.37 cm²
AVA (Vmax) 4.91 cm²
AVA(VTI)/BSA 2.70
M3 M4
+74.1
-74.1
cm/s
-40
cm/s
-40
-80
-120
75mm/s
33bpm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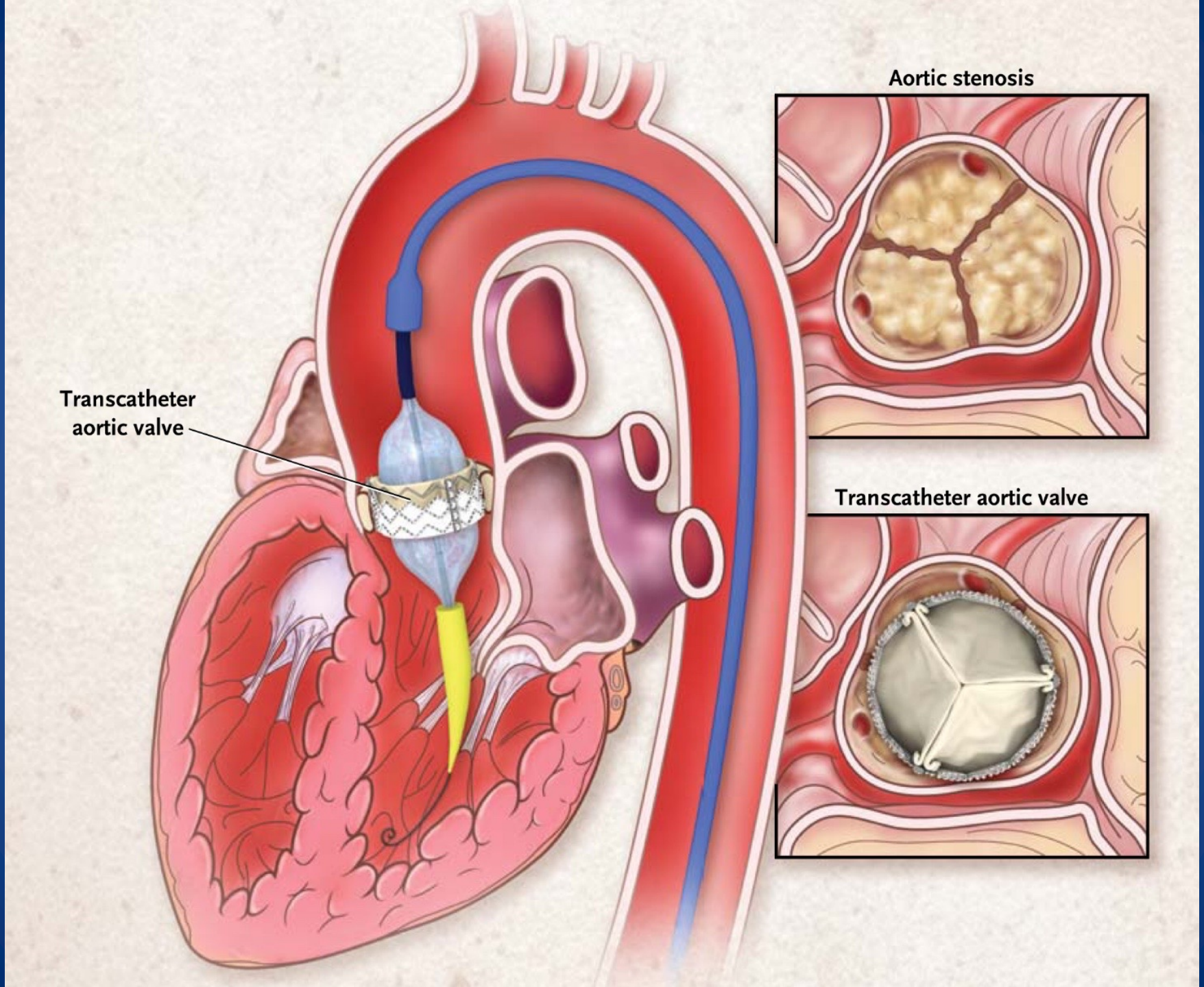
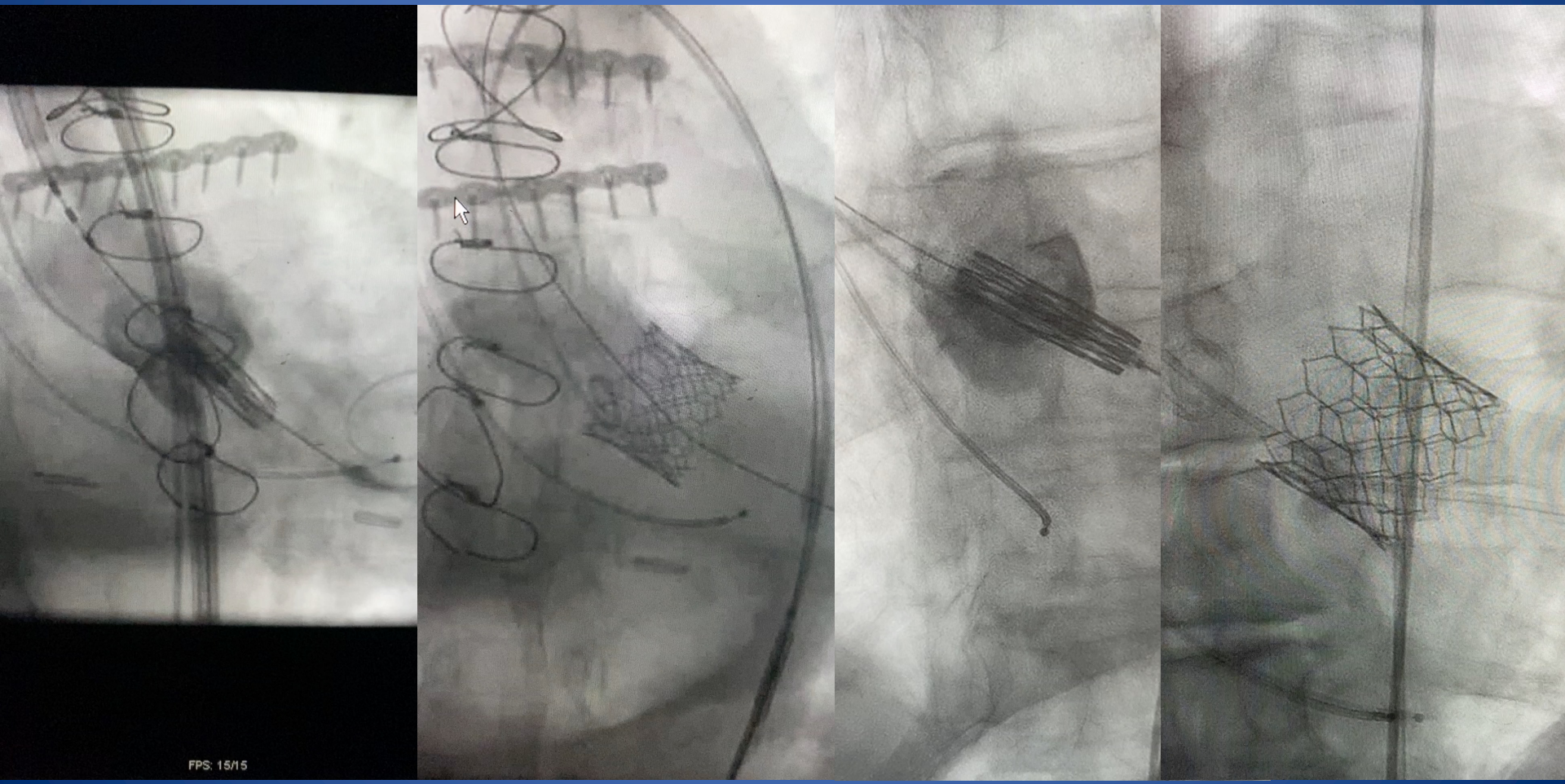
TAVR

TRANSCATHETER AORTIC VALVE REPLACEMENT


Transcatheter
aortic valve
Aortic stenosis
Transcatheter aortic valve

Valve Deployment



Next day

TRANSCATHETER AORTIC VALVE REPLACEMENT

- Performed in patient with Severe AS and

-High risk for conventional AVR (STS >10%, EuroSCORE >20%)

-contraindication to standard thoracotomy due to previous ones or radiation to chest wall

-porcelain aorta

- Options for placement

-Transfemoral TAVR -Subclavian

-Transapical TAVR -Direct Aortic

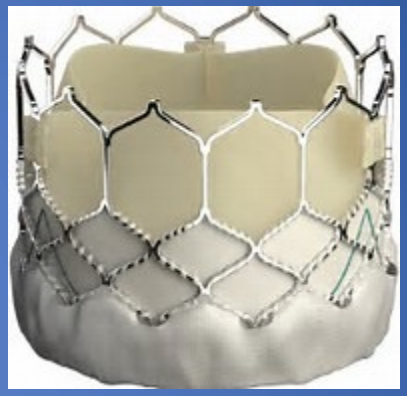
Types

-Balloon-expandable Edwards SAPIEN valve

SAPIEN 3 23mm, 26mm, 29mm

SAPIEN XT 20,23,26,29mm

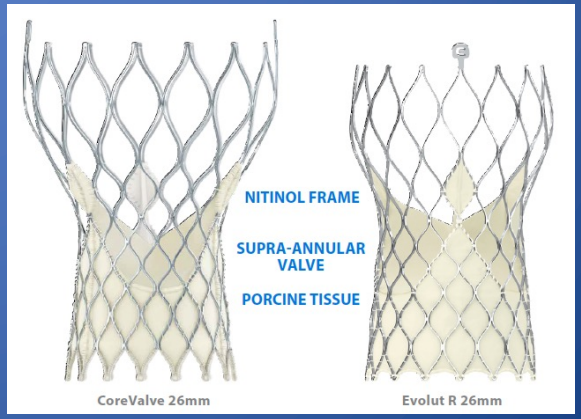
Tubular stainless steel stent with fabric valve cuff and contains leaflets derived from bovine pericardial tissue.



-Self –Expanding CoreValve ReValving system (medtronic)

Porcine prosthesis mounted within a nitinol frame

26mm and 29mm



2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease

2014 ACC/AHA GUIDELINES VHD

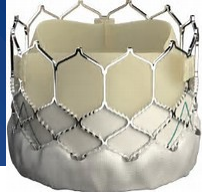


Table 7. Risk Assessment Combining STS Risk Estimate, Frailty, Major Organ System Dysfunction, and Procedure-Specific Impediments

	Low Risk (Must Meet ALL Criteria in This Column)	Intermediate Risk (Any 1 Criterion in This Column)	High Risk (Any 1 Criterion in This Column)	Prohibitive Risk (Any 1 Criterion in This Column)
STS PROM*	<4% **AND**	4%–8% **OR**	>8% **OR**	Predicted risk with surgery of death or major morbidity (all-cause) >50% at 1 y **OR**
Frailty†	None **AND**	1 Index (mild) **OR**	≥2 Indices (moderate to severe) **OR**	
Major organ system compromise not to be improved postoperatively‡	None **AND**	1 Organ system **OR**	No more than 2 organ systems **OR**	≥3 Organ systems **OR**
Procedure-specific impediment§	None	Possible procedure-specific impediment	Possible procedure-specific impediment	Severe procedure-specific impediment

*Use of the STS PROM to predict risk in a given institution with reasonable reliability is appropriate only if institutional outcomes are within 1 standard deviation of STS average observed/expected ratio for the procedure in question.

†Seven frailty indices: Katz Activities of Daily Living (independence in feeding, bathing, dressing, transferring, toileting, and urinary continence) and independence in ambulation (no walking aid or assist required or 5-meter walk in <6 s). Other scoring systems can be applied to calculate no, mild-, or moderate-to-severe frailty.

‡Examples of major organ system compromise: Cardiac—severe LV systolic or diastolic dysfunction or RV dysfunction, fixed pulmonary hypertension; CKD stage 3 or worse; pulmonary dysfunction with FEV1 <50% or $DLCO_2$ <50% of predicted; CNS dysfunction (dementia, Alzheimer's disease, Parkinson's disease, CVA with persistent physical limitation); GI dysfunction—Crohn's disease, ulcerative colitis, nutritional impairment, or serum albumin <3.0; cancer—active malignancy; and liver—any history of cirrhosis, variceal bleeding, or elevated INR in the absence of VKA therapy.

§Examples: tracheostomy present, heavily calcified ascending aorta, chest malformation, arterial coronary graft adherent to posterior chest wall, or radiation damage.

CKD indicates chronic kidney disease; CNS, central nervous system; CVA, stroke; $DLCO_2$, diffusion capacity for carbon dioxide; FEV1, forced expiratory volume in 1 s; GI, gastrointestinal; INR, international normalized ratio; LV, left ventricular; PROM, predicted risk of mortality; RV, right ventricular; STS, Society of Thoracic Surgeons; and VKA, vitamin K antagonist.

STS PROM (predicted risk of mortality)

The Society of Thoracic Surgeons' risk models predict the risk of operative mortality and

morbidity after adult cardiac surgery on the basis of patient demographic and clinical

variables.

Age, Sex, Height, Weight, EF, HF, Race, Creatinine, Cardiac sx, MI, Lund dz, CVA, PAD, DM, HNT, Immune, CAD, Status, Cardiogenic shock, IABP, inotropes, cardiac Qx, VHD

http://riskcalc.sts.org/stswebriskcalc/#/calculate

2014 ACC/AHA GUIDELINES VHD

Table 8. Stages of Valvular AS

Stage	Definition	Valve Anatomy	Valve Hemodynamics	Hemodynamic Consequences	Symptoms
A	At risk of AS	• Bicuspid aortic valve (or other congenital valve anomaly) • Aortic valve sclerosis	• Aortic V_{max} <2 m/s	• None	• None
B	Progressive AS	• Mild-to-moderate leaflet calcification of a bicuspid or trileaflet valve with some reduction in systolic motion or • Rheumatic valve changes with commissural fusion	• Mild AS: Aortic V_{max} 2.0–2.9 m/s or mean ΔP <20 mm Hg • Moderate AS: Aortic V_{max} 3.0–3.9 m/s or mean ΔP 20–39 mm Hg	• Early LV diastolic dysfunction may be present • Normal LVEF	• None
C: Asymptomatic severe AS					
C1	Asymptomatic severe AS	• Severe leaflet calcification or congenital stenosis with severely reduced leaflet opening	• Aortic V_{max} ≥4 m/s or mean ΔP ≥40 mm Hg • AVA typically is ≤1.0 cm^2 (or AVAi ≤0.6 cm^2/m^2) • Very severe AS is an aortic V_{max} ≥5 m/s or mean ΔP ≥60 mm Hg	• LV diastolic dysfunction • Mild LV hypertrophy • Normal LVEF	• None: Exercise testing is reasonable to confirm symptom status
C2	Asymptomatic severe AS with LV dysfunction	• Severe leaflet calcification or congenital stenosis with severely reduced leaflet opening	• Aortic V_{max} ≥4 m/s or mean ΔP ≥40 mm Hg • AVA typically ≤1.0 cm^2 (or AVAi ≤0.6 cm^2/m^2)	• LVEF <50%	• None
D: Symptomatic severe AS					
D1	Symptomatic severe high-gradient AS	• Severe leaflet calcification or congenital stenosis with severely reduced leaflet opening	• Aortic V_{max} ≥4 m/s or mean ΔP ≥40 mm Hg • AVA typically ≤1.0 cm^2 (or AVAi ≤0.6 cm^2/m^2) but may be larger with mixed AS/AR	• LV diastolic dysfunction • LV hypertrophy • Pulmonary hypertension may be present	• Exertional dyspnea or decreased exercise tolerance • Exertional angina • Exertional syncope or presyncope
D2	Symptomatic severe low-flow/low-gradient AS with reduced LVEF	• Severe leaflet calcification with severely reduced leaflet motion	• AVA ≤1.0 cm^2 with resting aortic V_{max} <4 m/s or mean ΔP <40 mm Hg • Dobutamine stress echocardiography shows AVA ≤1.0 cm^2 with V_{max} ≥4 m/s at any flow rate	• LV diastolic dysfunction • LV hypertrophy • LVEF <50%	• HF • Angina • Syncope or presyncope
D3	Symptomatic severe low-gradient AS with normal LVEF or paradoxical low-flow severe AS	• Severe leaflet calcification with severely reduced leaflet motion	• AVA ≤1.0 cm^2 with aortic V_{max} <4 m/s or mean ΔP <40 mm Hg • Indexed AVA ≤0.6 cm^2/m^2 and • Stroke volume index <35 mL/m^2 • Measured when patient is normotensive (systolic BP <140 mm Hg)	• Increased LV relative wall thickness • Small LV chamber with low stroke volume • Restrictive diastolic filling • LVEF ≥50%	• HF • Angina • Syncope or presyncope

2014 ACC/AHA GUIDELINES VHD

Table 10. Summary of Recommendations for AS: Choice of Surgical or Transcatheter Intervention

Recommendations	COR	LOE
Surgical AVR is recommended in patients who meet an indication for AVR (Section 3.2.3) with low or intermediate surgical risk	I	A
For patients in whom TAVR or high-risk surgical AVR is being considered, members of a Heart Valve Team should collaborate to provide optimal patient care	I	C
TAVR is recommended in patients who meet an indication for AVR for AS who have a prohibitive surgical risk and a predicted post-TAVR survival >12 mo	I	B
TAVR is a reasonable alternative to surgical AVR in patients who meet an indication for AVR (Section 3.2.3) and who have high surgical risk (Section 2.5)	IIa	B
Percutaneous aortic balloon dilation may be considered as a bridge to surgical or transcatheter AVR in severely symptomatic patients with severe AS	IIb	C
TAVR is not recommended in patients in whom existing comorbidities would preclude the expected benefit from correction of AS	III: No Benefit	B

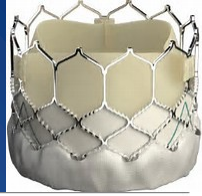
2017 VHD FOCUSED UPDATE

Recommendations for Choice of Intervention

COR	LOE	RECOMMENDATIONS	COMMENT/RATIONALE
I	C	For patients in whom TAVR or high-risk surgical AVR is being considered, a heart valve team consisting of an integrated, multidisciplinary group of healthcare professionals with expertise in VHD, cardiac imaging, interventional cardiology, cardiac anesthesia, and cardiac surgery should collaborate to provide optimal patient care.	2014 recommendation remains current.
I	B-NR	Surgical AR is recommended for symptomatic patients with severe AS (Stage D) and asymptomatic patients with severe AS (Stage C) who meet an indication for AVR when surgical risk is low or intermediate (42,43).	MODIFIED: LOE updated from A to B-NR. Prior recommendations for intervention choice did not specify patient symptoms. The patient population recommended for surgical AVR encompasses both symptomatic and asymptomatic patients who meet an indication for AVR with low-to-intermediate surgical risk. This is opposed to the patient population recommended for TAVR, in whom symptoms are required to be present. Thus, all recommendations for type of intervention now specify the symptomatic status of the patient.

See Online Data Supplements 5 and 9 (Updated From 2014 VHD Guideline)

2017 VHD FOCUSED UPDATE



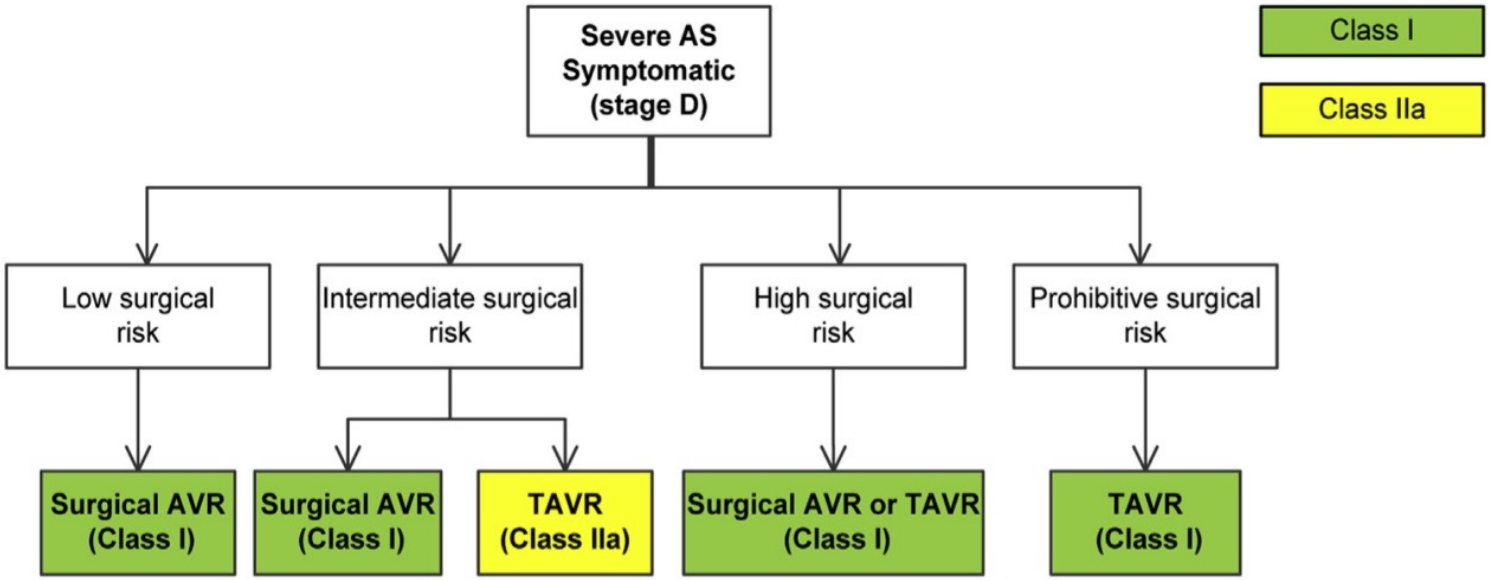
I / A See Online Data Supplement 9 (Updated From 2014 VHD Guideline)	Surgical AVR or TAVR is recommended for symptomatic patients with severe AS (Stage D) and high risk for surgical AVR, depending on patient-specific procedural risks, values, and preferences (49–51).	**MODIFIED: COR updated from IIa to I, LOE updated from B to A.** Longer-term follow-up and additional RCTs have demonstrated that TAVR is equivalent to surgical AVR for severe symptomatic AS when surgical risk is high.

(continued)

I / A See Online Data Supplements 5 and 9 (Updated From 2014 VHD Guideline)	TAVR is recommended for symptomatic patients with severe AS (Stage D) and a prohibitive risk for surgical AVR who have a predicted post-TAVR survival greater than 12 months (58–61).	**MODIFIED: LOE updated from B to A.** Longer-term follow-up from RCTs and additional observational studies has demonstrated the benefit of TAVR in patien with a prohibitive surgical risk.
IIa / B-R See Online Data Supplements 5 and 9 (Updated From 2014 VHD Guideline)	TAVR is a reasonable alternative to surgical AVR for symptomatic patients with severe AS (Stage D) and an intermediate surgical risk, depending on patient-specific procedural risks, values, and preferences (62–65).	**NEW:** New RCT showed noninferiority of TAVR to surgical AVR in symptomatic patients with severe AS at intermediate surgical risk.
IIb / C	Percutaneous aortic balloon dilation may be considered as a bridge to surgical AVR or TAVR for symptomatic patients with severe AS.	2014 recommendation remains current.
III: No Benefit / B	TAVR is not recommended in patients in whom existing comorbidities would preclude the expected benefit from correction of AS (61).	2014 recommendation remains current.

2017 VHD FOCUSED UPDATE

FIGURE 1 **Choice of TAVR Versus Surgical AVR in the Patient With Severe Symptomatic AS**



AS indicates aortic stenosis; AVR, aortic valve replacement; and TAVR, transcatheter aortic valve replacement.

PARTNER TRIAL

1057 ptes Divided in two cohorts

-A (699): TAVR vs Surgical AVR

-B (358): TAVR vs medical management and/or balloon valvuloplasty

PARTNER A TRIAL
Placement of Aortic Transcatheter Valves trial

Transcatheter versus Surgical Aortic-Valve Replacement in High-Risk Patients

NEJM june 9, 2011 vol. 364 no. 23

PARTNER A TRIAL

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JUNE 9, 2011 VOL. 364 NO. 23

Transcatheter versus Surgical Aortic-Valve Replacement in High-Risk Patients

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ABSTRACT

BACKGROUND

The use of transcatheter aortic-valve replacement has been shown to reduce mortality among high-risk patients with aortic stenosis who are not candidates for surgical replacement. However, the two procedures have not been compared in a randomized trial involving high-risk patients who are still candidates for surgical replacement.

METHODS

At 25 centers, we randomly assigned 699 high-risk patients with severe aortic stenosis to undergo either transcatheter aortic-valve replacement with a balloon-expandable bovine pericardial valve (either a transfemoral or a transapical approach) or surgical replacement. The primary end point was death from any cause at 1 year. The primary hypothesis was that transcatheter replacement is not inferior to surgical replacement.

RESULTS

The rates of death from any cause were 3.4% in the transcatheter group and 6.5% in the surgical group at 30 days (P=0.07) and 24.2% and 26.8%, respectively, at 1 year (P=0.44), a reduction of 2.6 percentage points in the transcatheter group (upper limit of the 95% confidence interval, 3.0 percentage points; predefined margin, 7.5 percentage points; P=0.001 for noninferiority). The rates of major stroke were 3.8% in the transcatheter group and 2.1% in the surgical group at 30 days (P=0.20) and 5.1% and 2.4%, respectively, at 1 year (P=0.07). At 30 days, major vascular complications were significantly more frequent with transcatheter replacement (11.0% vs. 3.2%, P<0.001); adverse events that were more frequent after surgical replacement included major bleeding (9.3% vs. 19.5%, P<0.001) and new-onset atrial fibrillation (8.6% vs. 16.0%, P=0.006). More patients undergoing transcatheter replacement had an improvement in symptoms at 30 days, but by 1 year, there was not a significant between-group difference.

CONCLUSIONS

In high-risk patients with severe aortic stenosis, transcatheter and surgical procedures for aortic-valve replacement were associated with similar rates of survival at 1 year, although there were important differences in periprocedural risks. (Funded by Edwards Lifesciences; Clinical Trials.gov number, NCT00530894.)

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*The investigators, institutions, and research organizations participating in the Placement of Aortic Transcatheter Valves (PARTNER) trial are in the Supplementary Appendix, available at NEJM.org.

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Method

May 11, 2007-August 28, 2009

-enrolled 699 patients

-severe aortic stenosis

-cardiac symptoms (New York Heart Association [NYHA] class II function or worse)

- 22 centers in the United States, 2 centers in Canada, and 1 center in Germany
- Patients first underwent evaluation of their peripheral arteries before randomization in order to separate those eligible for transfemoral placement from those who would require transapical placement

- **Inclusion Criteria**
- Severe AS defined as:
  - Aortic valve area <0.8 cm^2 AND either of:
    - Mean aortic valve gradient ≥40 mmHg
    - Peak aortic jet velocity of ≥4 m/sec
- NYHA II, III, or IV symptoms
- Surgical candidate for surgical AVR
- High-risk for operative complications defined as either of:
  - Coexisting conditions with ≥15% 30 day post-op risk of death
  - STS risk score ≥10 (out of 100, higher is greater surgical risk)

Table 2. Clinical Outcomes at 30 Days and 1 Year in the Intention-to-Treat Population.*

Outcome	30 Days			1 Year		
	Transcatheter Replacement (N=348)	Surgical Replacement (N=351)	P Value	Transcatheter Replacement (N=348)	Surgical Replacement (N=351)	P Value
	no. of patients (%)			*no. of patients (%)*		
Death						
From any cause	12 (3.4)	22 (6.5)	0.07	84 (24.2)	89 (26.8)	0.44
From cardiac causes	11 (3.2)	10 (3.0)	0.90	47 (14.3)	40 (13.0)	0.63
Repeat hospitalization	15 (4.4)	12 (3.7)	0.64	58 (18.2)	45 (15.5)	0.38
Death or repeat hospitalization	25 (7.2)	33 (9.7)	0.24	120 (34.6)	119 (35.9)	0.73
Stroke or transient ischemic attack						
Either	19 (5.5)	8 (2.4)	0.04	27 (8.3)	13 (4.3)	0.04
Transient ischemic attack	3 (0.9)	1 (0.3)	0.33	7 (2.3)	4 (1.5)	0.47
Stroke						
Minor	3 (0.9)	1 (0.3)	0.34	3 (0.9)	2 (0.7)	0.84
Major	13 (3.8)	7 (2.1)	0.20	17 (5.1)	8 (2.4)	0.07
Death from any cause or major stroke	24 (6.9)	28 (8.2)	0.52	92 (26.5)	93 (28.0)	0.68
Myocardial infarction	0	2 (0.6)	0.16	1 (0.4)	2 (0.6)	0.69
Vascular complication						
Any	59 (17.0)	13 (3.8)	<0.001	62 (18.0)	16 (4.8)	<0.001
Major	38 (11.0)	11 (3.2)	<0.001	39 (11.3)	12 (3.5)	<0.001
Acute kidney injury						
Creatinine >3 mg/dl (265 μmol/liter)	4 (1.2)	4 (1.2)	0.95	12 (3.9)	8 (2.7)	0.41
Renal-replacement therapy	10 (2.9)	10 (3.0)	0.95	18 (5.4)	20 (6.5)	0.56
Major bleeding	32 (9.3)	67 (19.5)	<0.001	49 (14.7)	85 (25.7)	<0.001
Endocarditis	0	1 (0.3)	0.32	2 (0.6)	3 (1.0)	0.63
New-onset atrial fibrillation†	30 (8.6)	56 (16.0)	0.006	42 (12.1)	60 (17.1)	0.07
New pacemaker	13 (3.8)	12 (3.6)	0.89	19 (5.7)	16 (5.0)	0.68

* All percentages are Kaplan–Meier estimates at the specific time point and thus do not equal the number of patients divided by the total number in the study group.
† The presence of new-onset atrial fibrillation was determined in an electrocardiography core laboratory.

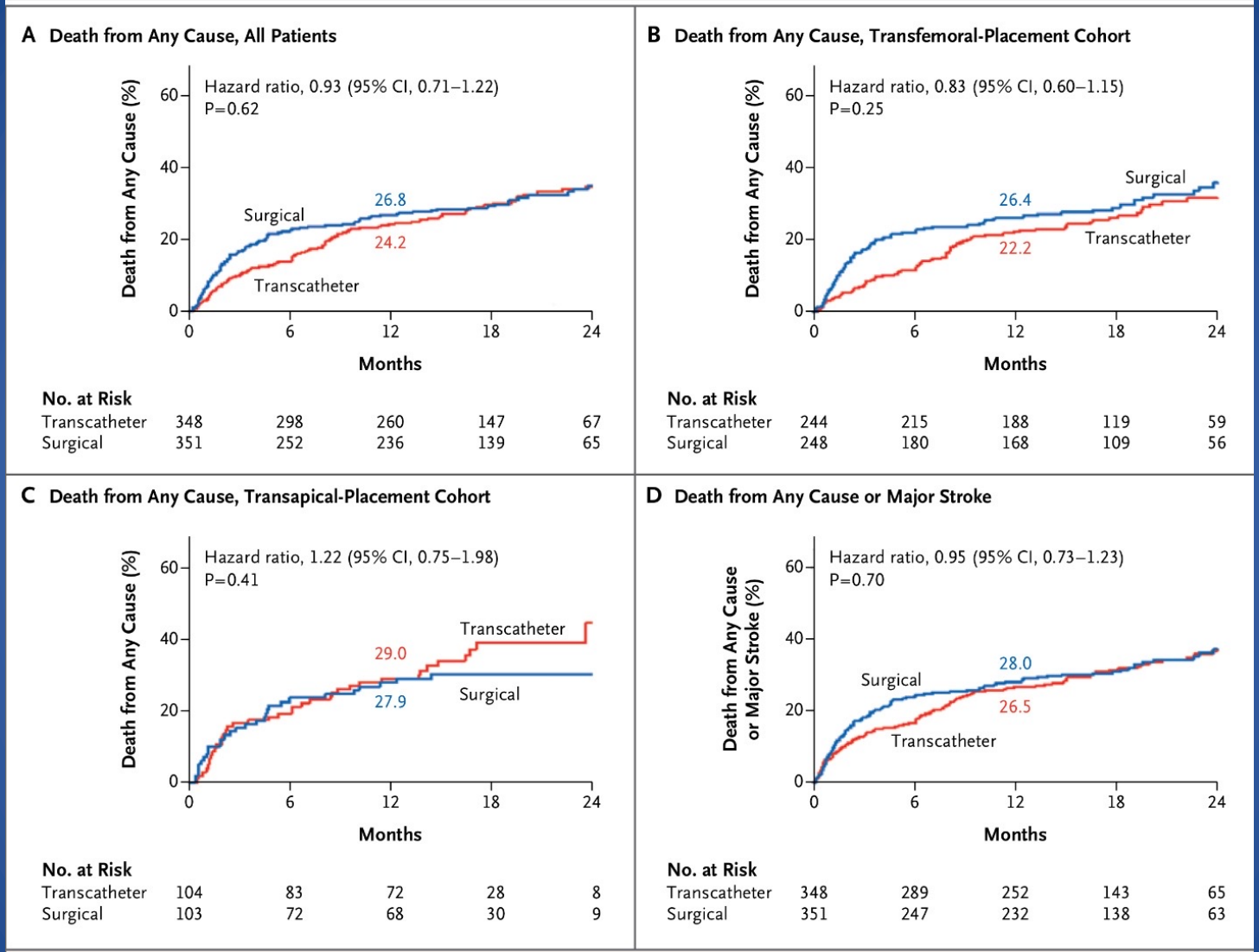

Figure 2. Time-to-Event Curves for the Primary End Point and Other Selected End Points.

Time-to-event curves are shown for death from any cause in all patients (Panel A), in the transfemoral-placement cohort (Panel B), and in the transapical-placement cohort (Panel C) and for a composite of death or major stroke (Panel D) among patients who were randomly assigned to undergo either transcatheter aortic-valve replacement (TAVR) or surgical aortic-valve replacement (AVR). The event rates were calculated with the use of Kaplan–Meier methods and compared with the use of the log-rank test.

Conclusion

- There is no significant difference in 30 day or 1 year mortality between AVR and TAVR
- There was a higher rate of stroke and vascular complications with TAVR
- AVR had higher incidence of bleeding and atrial fibrillation

PARTNER B TRIAL

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 OCTOBER 21, 2010 VOL. 363 NO. 17

Transcatheter Aortic-Valve Implantation for Aortic Stenosis in Patients Who Cannot Undergo Surgery

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ABSTRACT

BACKGROUND

Many patients with severe aortic stenosis and coexisting conditions are not candidates for surgical replacement of the aortic valve. Recently, transcatheter aortic-valve implantation (TAVI) has been suggested as a less invasive treatment for high-risk patients with aortic stenosis.

METHODS

We randomly assigned patients with severe aortic stenosis, whom surgeons considered not to be suitable candidates for surgery, to standard therapy (including balloon aortic valvuloplasty) or transfemoral transcatheter implantation of a balloon-expandable bovine pericardial valve. The primary end point was the rate of death from any cause.

RESULTS

A total of 358 patients with aortic stenosis who were not considered to be suitable candidates for surgery underwent randomization at 21 centers (17 in the United States). At 1 year, the rate of death from any cause (Kaplan–Meier analysis) was 30.7% with TAVI, as compared with 50.7% with standard therapy (hazard ratio with TAVI, 0.55; 95% confidence interval [CI], 0.40 to 0.74; P<0.001). The rate of the composite end point of death from any cause or repeat hospitalization was 42.5% with TAVI as compared with 71.6% with standard therapy (hazard ratio, 0.46; 95% CI, 0.35 to 0.59; P<0.001). Among survivors at 1 year, the rate of cardiac symptoms (New York Heart Association class III or IV) was lower among patients who had undergone TAVI than among those who had received standard therapy (25.2% vs. 58.0%, P<0.001). At 30 days, TAVI, as compared with standard therapy, was associated with a higher incidence of major strokes (5.0% vs. 1.1%, P=0.06) and major vascular complications (16.2% vs. 1.1%, P<0.001). In the year after TAVI, there was no deterioration in the functioning of the bioprosthetic valve, as assessed by evidence of stenosis or regurgitation on an echocardiogram.

CONCLUSIONS

In patients with severe aortic stenosis who were not suitable candidates for surgery,

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*The investigators, institutions, and research organizations participating in the Placement of Aortic Transcatheter Valves (PARTNER) trial are listed in the Supplementary Appendix, available at NEJM.org.

This article (10.1056/NEJMoa1008232) was published on September 22, 2010, at

Method

- 358 patients
- TAVI 179 and Standard Therapy 179
- 21 centers (17 in US)
- 2007-2009
- Analysis: intention to treat
- Primary outcomes

-all cause mortality

-all cause mortality or time to first repeat hospitalization for valve procedure related deterioration

Inclusion criteria

- Severe AS

-AVA <0.8cm2 or AVA index <0.5cm2/m2

-Mean Aortic valve gradient >40mmHg

-Peak Aortic jet velocity >4m/sec

- NYHA II, III, IV
- Poor surgical candidate (per 2 surgeons):

-STS>10%

-Coexisting conditions with >15% 30 d POP risk of death

-Coexisting conditions with >50% 30 d POP risk of death or a serious irreversible condition

PARTNER B TRIAL

Table 2. Clinical Outcomes at 30 Days and 1 Year.*

Outcome	30 Days			1 Year		
	TAVI (N=179)	Standard Therapy (N=179)	P Value†	TAVI (N=179)	Standard Therapy (N=179)	P Value†
	no. of patients (%)			*no. of patients (%)*		
Death						
From any cause	9 (5.0)	5 (2.8)	0.41	55 (30.7)	89 (49.7)	<0.001
From cardiovascular cause‡	8 (4.5)	3 (1.7)	0.22	35 (19.6)	75 (41.9)	<0.001
Repeat hospitalization§	10 (5.6)	18 (10.1)	0.17	40 (22.3)	79 (44.1)	<0.001
Death from any cause or repeat hospitalization§	19 (10.6)	22 (12.3)	0.74	76 (42.5)	126 (70.4)	<0.001
Stroke or TIA						
All	12 (6.7)	3 (1.7)	0.03	19 (10.6)	8 (4.5)	0.04
TIA	0	0	—	1 (0.6)	0	1.00
Stroke						
Minor	3 (1.7)	1 (0.6)	0.62	4 (2.2)	1 (0.6)	0.37
Major	9 (5.0)	2 (1.1)	0.06	14 (7.8)	7 (3.9)	0.18
Death from any cause or major stroke	15 (8.4)	7 (3.9)	0.12	59 (33.0)	90 (50.3)	0.001
Myocardial infarction						
All	0	0	—	1 (0.6)	1 (0.6)	1.00
Periprocedural	0	0	—	0	0	—
Vascular complications						
All	55 (30.7)	9 (5.0)	<0.001	58 (32.4)	13 (7.3)	<0.001
Major	29 (16.2)	2 (1.1)	<0.001	30 (16.8)	4 (2.2)	<0.001
Acute kidney injury						
Creatinine >3 mg/dl (265 μmol/liter)¶	0	1 (0.6)	1.00	2 (1.1)	5 (2.8)	0.45
Renal-replacement therapy‖	2 (1.1)	3 (1.7)	1.00	3 (1.7)	6 (3.4)	0.50
Major bleeding	30 (16.8)	7 (3.9)	<0.001	40 (22.3)	20 (11.2)	0.007
Cardiac reintervention						
Balloon aortic valvuloplasty	1 (0.6)**	2 (1.1)	1.00	1 (0.6)	66 (36.9)††	<0.001
Repeat TAVI‡‡	3 (1.7)	NA	—	3 (1.7)	NA	—
Aortic-valve replacement	0	3 (1.7)	0.25	2 (1.1)**	17 (9.5)	<0.001
Endocarditis	0	0	—	2 (1.1)	1 (0.6)	0.31
New atrial fibrillation	1 (0.6)	2 (1.1)	1.00	1 (0.6)	3 (1.7)	0.62
New pacemaker	6 (3.4)	9 (5.0)	0.60	8 (4.5)	14 (7.8)	0.27

* NA denotes not applicable, TAVI transcatheter aortic-valve implantation, and TIA transient ischemic attack.
† P values are for between-group comparisons of the frequency of the event at each time point.
‡ Deaths from unknown causes were assumed to be deaths from cardiovascular causes.
§ Repeat hospitalizations were included if they were due to aortic stenosis or complications of the valve procedure (e.g., TAVI).
¶ Patients who received renal-replacement therapy were not included.
‖ Patients who received renal-replacement therapy after randomization were included.
** One patient in the TAVI group did not receive TAVI (because of failed access) and subsequently underwent balloon aortic valvuloplasty,

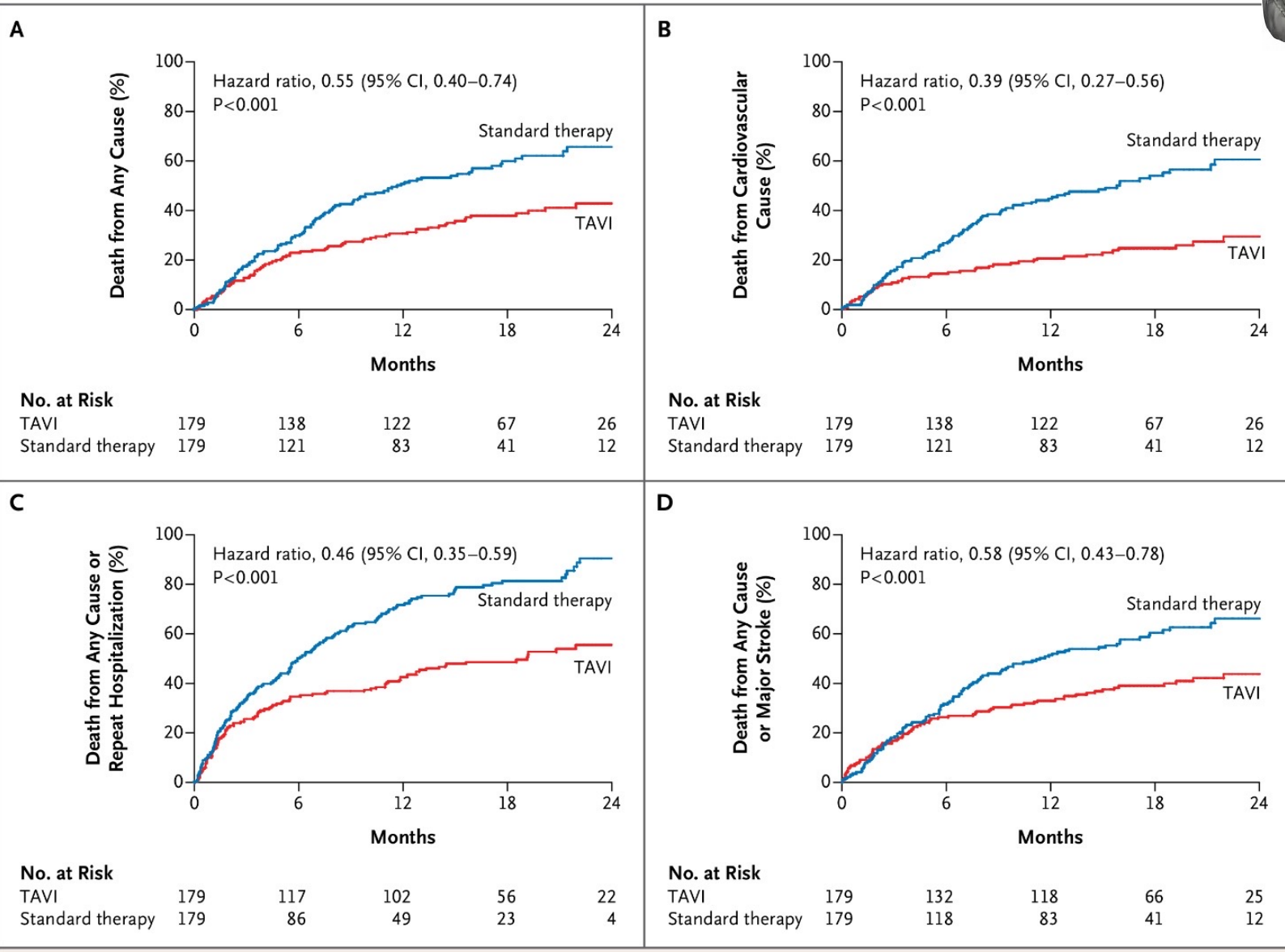

Figure 1. Time-to-Event Curves for the Primary End Point and Other Selected End Points.

Event rates were calculated with the use of Kaplan–Meier methods and compared with the use of the log-rank test. Deaths from unknown causes were assumed to be deaths from cardiovascular causes.

CONCLUSION

- TAVR in patient with severe Aortic Stenosis who are poor surgical candidates reduces all cause mortality when compared to standard therapy.
- TAVR vs Standard therapy has higher incidence of stroke and major bleeding at 1 year.

Lowering Risk

PARTNER 2 TRIAL

The NEW ENGLAND JOURNAL of MEDICINE

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Transcatheter or Surgical Aortic-Valve Replacement in Intermediate-Risk Patients

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ABSTRACT

BACKGROUND

Previous trials have shown that among high-risk patients with aortic stenosis, survival rates are similar with transcatheter aortic-valve replacement (TAVR) and surgical aortic-valve replacement. We evaluated the two procedures in a randomized trial involving intermediate-risk patients.

METHODS

We randomly assigned 2032 intermediate-risk patients with severe aortic stenosis, at 57 centers, to undergo either TAVR or surgical replacement. The primary end point was death from any cause or disabling stroke at 2 years. The primary hypothesis was that TAVR would not be inferior to surgical replacement. Before randomization, patients were entered into one of two cohorts on the basis of clinical and imaging findings; 76.3% of the patients were included in the transfemoral-access cohort and 23.7% in the transthoracic-access cohort.

RESULTS

The rate of death from any cause or disabling stroke was similar in the TAVR group and the surgery group (P=0.001 for noninferiority). At 2 years, the Kaplan–Meier event rates were 19.3% in the TAVR group and 21.1% in the surgery group (hazard ratio in the TAVR group, 0.89; 95% confidence interval [CI], 0.73 to 1.09; P=0.25). In the transfemoral-access cohort, TAVR resulted in a lower rate of death or disabling stroke than surgery (hazard ratio, 0.79; 95% CI, 0.62 to 1.00; P=0.05), whereas in the transthoracic-access cohort, outcomes were similar in the two groups. TAVR resulted in larger aortic-valve areas than did surgery and also resulted in lower rates of acute kidney injury, severe bleeding, and new-onset atrial fibrillation; surgery resulted in fewer major vascular complications and less paravalvular aortic regurgitation.

CONCLUSIONS

In intermediate-risk patients, TAVR was similar to surgical aortic-valve replacement with respect to the primary end point of death or disabling stroke. (Funded by Edwards Lifesciences; PARTNER 2 ClinicalTrials.gov number, NCT01314313.)

The authors' affiliations are listed in the Appendix. Address reprint requests to Dr. Leon at Columbia University Medical Center, 161 Ft. Washington Ave., 6th Floor, New York, NY 10032, or at mleon@crf.org.

*A complete list of investigators in the Placement of Aortic Transcatheter Valves (PARTNER) 2 trial is provided in the Supplementary Appendix, available at NEJM.org.

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PARTNER 2

- METHOD

-2032 Patients with symptomatic severe AS at intermediate risk (4-8%)

-TAVI 1011 and Surgical AVR 1021

-57 centers in US and Canada

-December 2011 – November 2013

-Analysis: intention to treat

-Primary outcome: All cause mortality or disabling stroke at 2 years.

Inclusion criteria

- Severe AS

-AVA <0.8cm2 and either of:

-mean aortic valve gradient >40mmHg

-Peak Vel <4m/sec

- NYHA II, III, IV
- Candidate for AVR
- Intermediate risk for operative complications:

-STS >4

-STS <4 with heart team determination of intermediate risk due to comorbidities not presented in STS risk score

PARTNER 2 TRIAL

Table 2. Clinical End Points at 30 Days, 1 Year, and 2 Years.*

End Point	At 30 Days			At 1 Year			At 2 Years		
	TAVR (N=1011)	Surgery (N=1021)	P Value	TAVR (N=1011)	Surgery (N=1021)	P Value	TAVR (N=1011)	Surgery (N=1021)	P Value
	no. of patients (%)			*no. of patients (%)*			*no. of patients (%)*		
Death from any cause or disabling stroke	62 (6.1)	80 (8.0)	0.11	145 (14.5)	160 (16.4)	0.24	192 (19.3)	202 (21.1)	0.33
Death									
From any cause	39 (3.9)	41 (4.1)	0.78	123 (12.3)	124 (12.9)	0.69	166 (16.7)	170 (18.0)	0.45
From cardiac causes	33 (3.3)	32 (3.2)	0.92	70 (7.1)	77 (8.1)	0.40	97 (10.1)	104 (11.3)	0.38
Not from cardiac causes	6 (0.6)	9 (0.9)	0.41	53 (5.6)	47 (5.2)	0.71	69 (7.4)	65 (7.4)	0.98
Neurologic event									
Any event	64 (6.4)	65 (6.5)	0.94	99 (10.1)	93 (9.7)	0.76	121 (12.7)	103 (11.0)	0.25
Transient ischemic attack	9 (0.9)	4 (0.4)	0.17	23 (2.4)	16 (1.8)	0.38	34 (3.7)	20 (2.3)	0.09
Any stroke	55 (5.5)	61 (6.1)	0.57	78 (8.0)	79 (8.1)	0.88	91 (9.5)	85 (8.9)	0.67
Disabling stroke	32 (3.2)	43 (4.3)	0.20	49 (5.0)	56 (5.8)	0.46	59 (6.2)	61 (6.4)	0.83
Nondisabling stroke	23 (2.3)	18 (1.8)	0.43	30 (3.0)	24 (2.5)	0.44	33 (3.4)	27 (2.9)	0.51
Rehospitalization	64 (6.5)	62 (6.5)	0.99	142 (14.8)	135 (14.7)	0.92	183 (19.6)	156 (17.3)	0.22
Death from any cause or rehospitalization	99 (9.8)	101 (10.2)	0.78	234 (23.4)	225 (23.3)	0.97	303 (30.5)	281 (29.6)	0.67
Death from any cause, any stroke, or rehospitalization	140 (13.9)	153 (15.3)	0.37	274 (27.4)	276 (28.3)	0.64	344 (34.6)	326 (33.9)	0.75
Myocardial infarction	12 (1.2)	19 (1.9)	0.22	24 (2.5)	29 (3.0)	0.47	33 (3.6)	37 (4.1)	0.56
Major vascular complication	80 (7.9)	51 (5.0)	0.008	84 (8.4)	54 (5.3)	0.007	86 (8.6)	55 (5.5)	0.006
Life-threatening or disabling bleeding	105 (10.4)	442 (43.4)	<0.001	151 (15.2)	460 (45.5)	<0.001	169 (17.3)	471 (47.0)	<0.001
Acute kidney injury	13 (1.3)	31 (3.1)	0.006	32 (3.4)	48 (5.0)	0.07	36 (3.8)	57 (6.2)	0.02
New atrial fibrillation	91 (9.1)	265 (26.4)	<0.001	100 (10.1)	272 (27.2)	<0.001	110 (11.3)	273 (27.3)	<0.001
New permanent pacemaker	85 (8.5)	68 (6.9)	0.17	98 (9.9)	85 (8.9)	0.43	114 (11.8)	96 (10.3)	0.29
Endocarditis	0	0	—	7 (0.8)	6 (0.7)	0.84	11 (1.2)	6 (0.7)	0.22
Aortic-valve reintervention	4 (0.4)	0	0.05	11 (1.2)	4 (0.5)	0.10	13 (1.4)	5 (0.6)	0.09
Coronary obstruction	4 (0.4)	6 (0.6)	0.53	4 (0.4)	6 (0.6)	0.53	4 (0.4)	6 (0.6)	0.53

* All percentages are Kaplan–Meier estimates at the specific time point and thus do not equal the number of patients divided by the total number of patients in the treatment group. P values are for point-in-time comparisons.

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The New England Journal of Medicine

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PARTNER 2 TRIAL

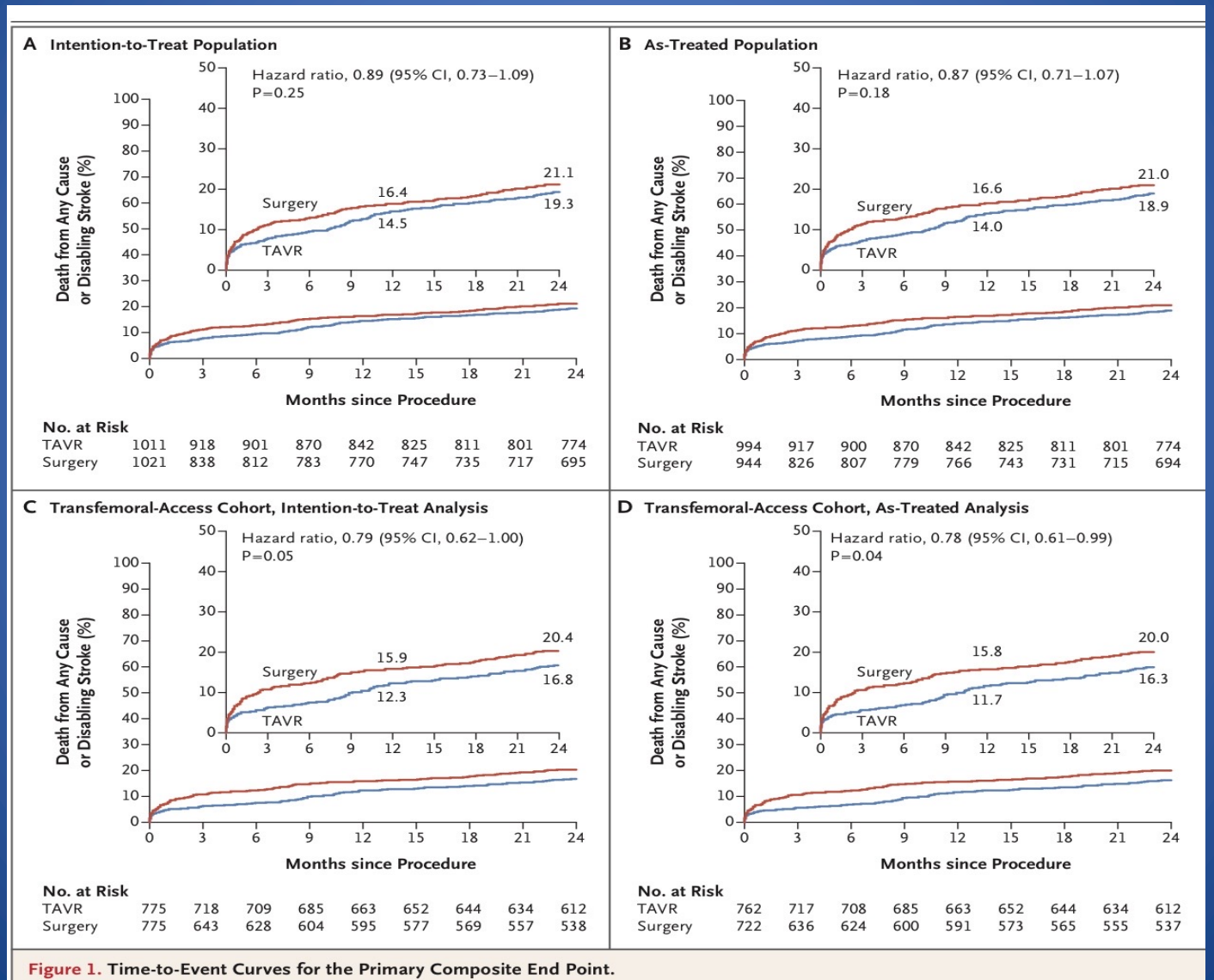


Figure 1. Time-to-Event Curves for the Primary Composite End Point.
The insets show the same data on an enlarged y axis. TAVR denotes transcatheter aortic-valve replacement.

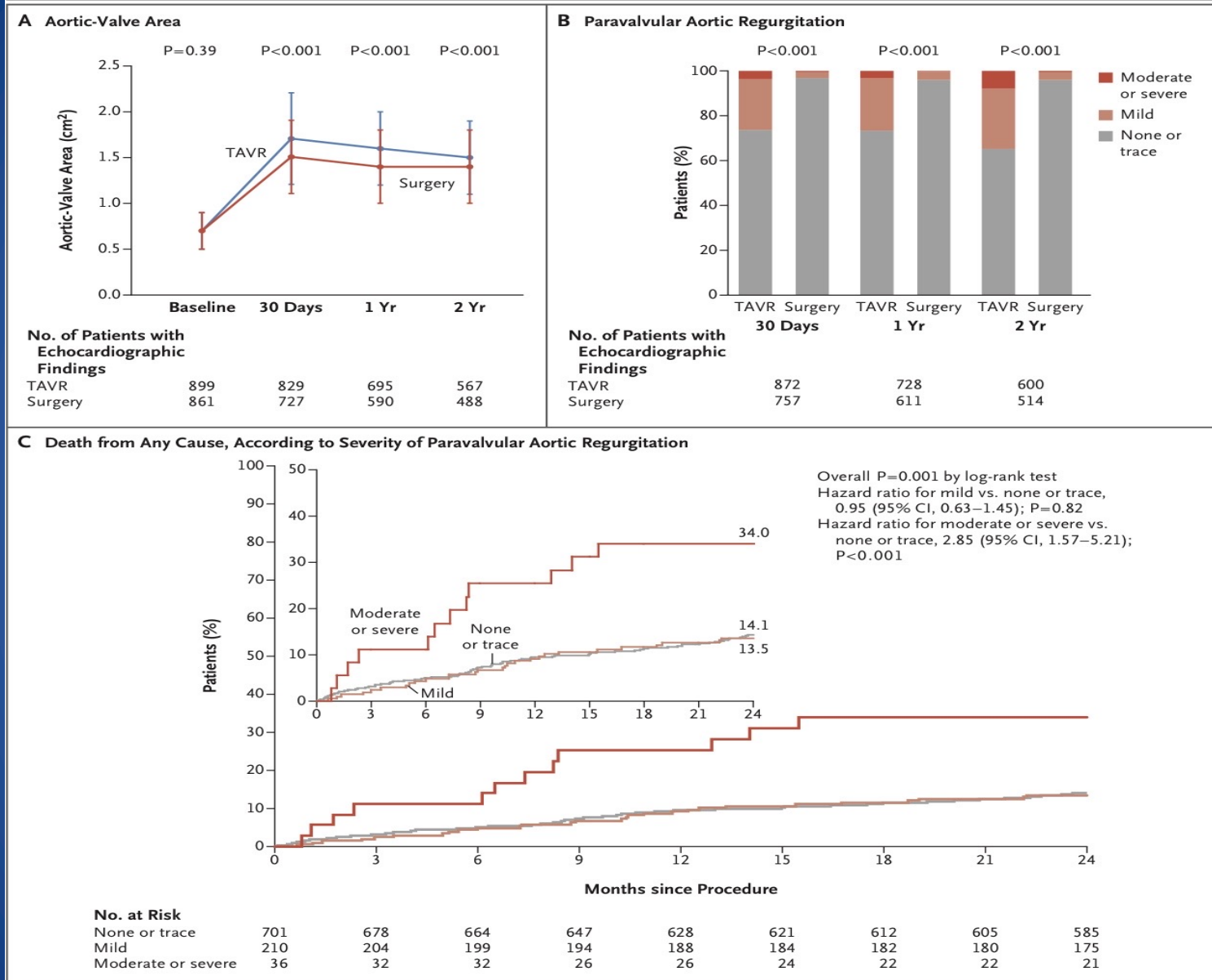


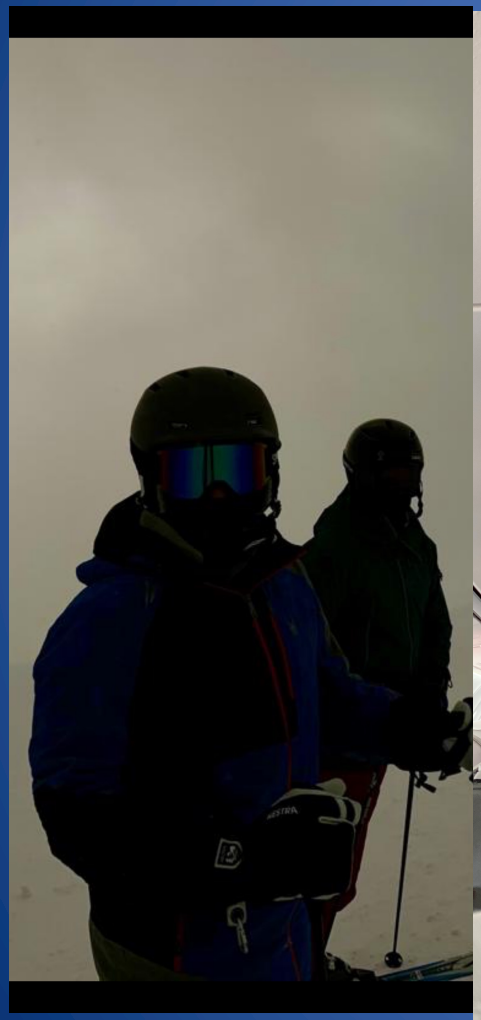
Figure 3. Echocardiographic Findings.

Panel A shows the change in aortic-valve area from baseline to 2 years, and Panel B the percentage of patients with paravalvular aortic regurgitation at 30 days, 1 year, and 2 years after the procedure. Panel C shows time-to-event curves for death from any cause according to the severity of paravalvular aortic regurgitation (post hoc analysis). The inset shows the same data on an enlarged y axis.

Conclusion

- In patients who have severe Aortic Stenosis and who are at intermediated risk with a periprocedural mortality of 4-8% per STS, TAVR was not inferior to surgical AVR with respect to all cause mortality and stroke at 2 yrs.
- Surgical AVR had 30% higher rate of major bleeding and 16 % of A fib.

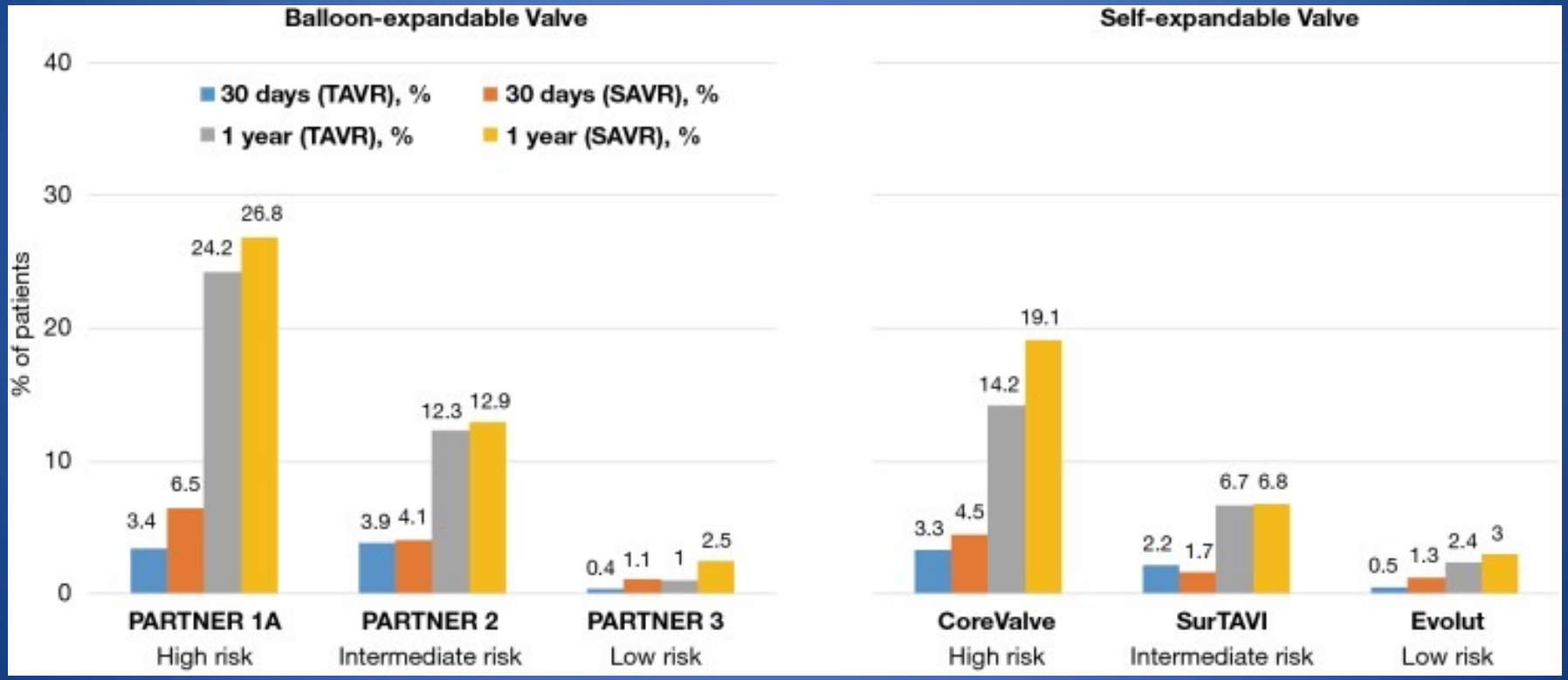
What is new? Partner 3 Trial



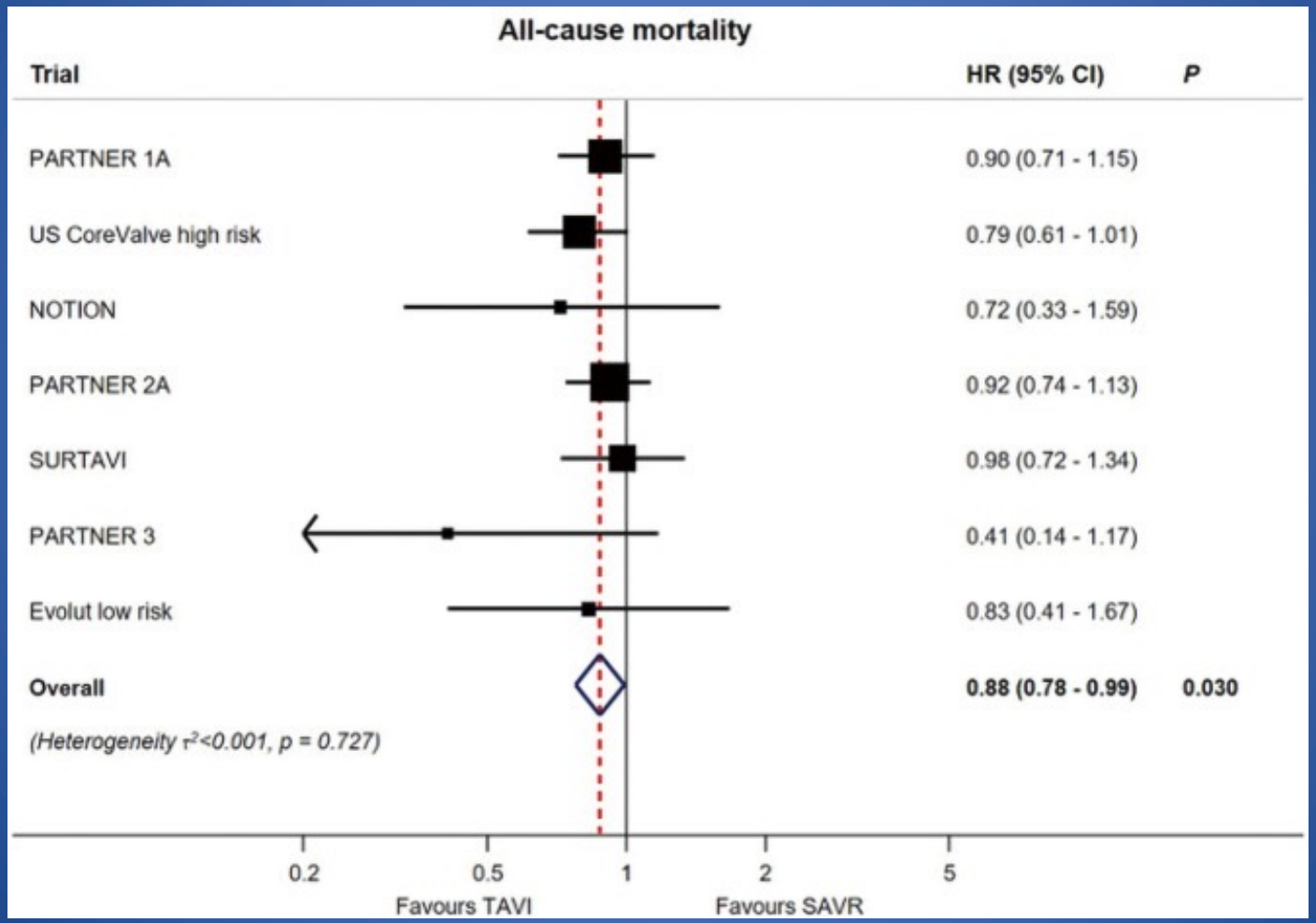
What is new?

- **FDA Expands TAVR Indication to Low-Risk Patients**
- **Aug 16, 2019ACC News Story**
- Share via: **56**
- Print
- Font Size A A A
- The U.S. Food and Drug Administration (FDA) has approved an expanded indication for several transcatheter heart valves (Sapien 3, Sapien 3 Ultra, CoreValve Evolut R and CoreValve Evolut PRO) to include patients with severe aortic valve stenosis at low surgical risk.
- The FDA is the first medical products regulatory body in the world to expand the indication for transcatheter aortic valve replacement (TAVR) to this patient population. As part of the approval process, manufacturers are required to continue to follow patients enrolled in their randomized studies for 10 years to further monitor safety and effectiveness, including long-term valve durability. Additionally, manufacturers will also participate in the STS/ACC TVT Registry in order to provide the FDA with additional surveillance over a 10-year period.

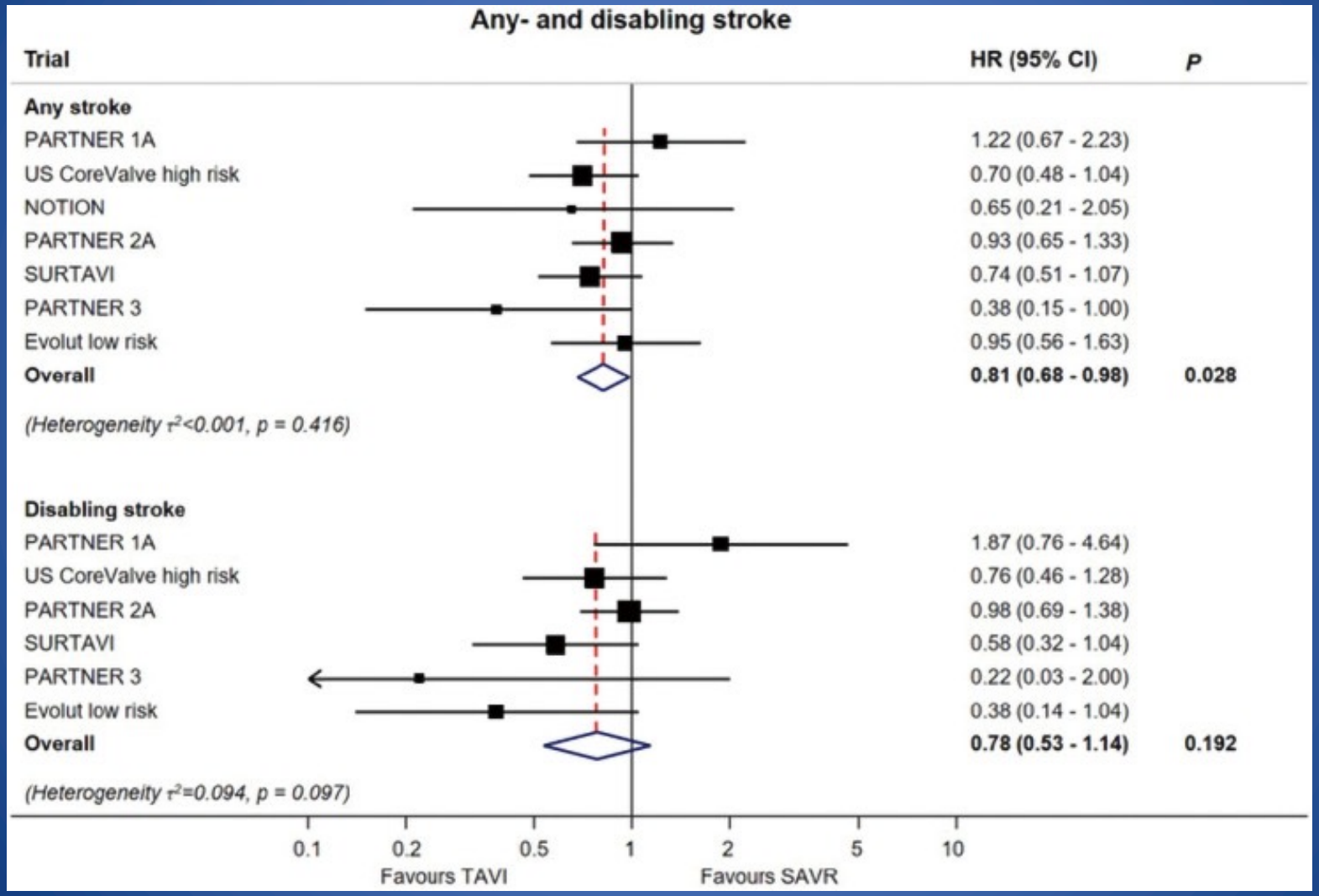
TAVR vs SAVR


Balloon-expandable Valve
Self-expandable Valve
30 days (TAVR), %
30 days (SAVR), %
1 year (TAVR), %
1 year (SAVR), %
% of patients
40
30
20
10
0
3.4
6.5
24.2
26.8
3.9
4.1
12.3
12.9
0.4
1.1
1
2.5
3.3
4.5
14.2
19.1
2.2
1.7
6.7
6.8
0.5
1.3
2.4
3
PARTNER 1A
High risk
PARTNER 2
Intermediate risk
PARTNER 3
Low risk
CoreValve
High risk
SurTAVI
Intermediate risk
Evolut
Low risk

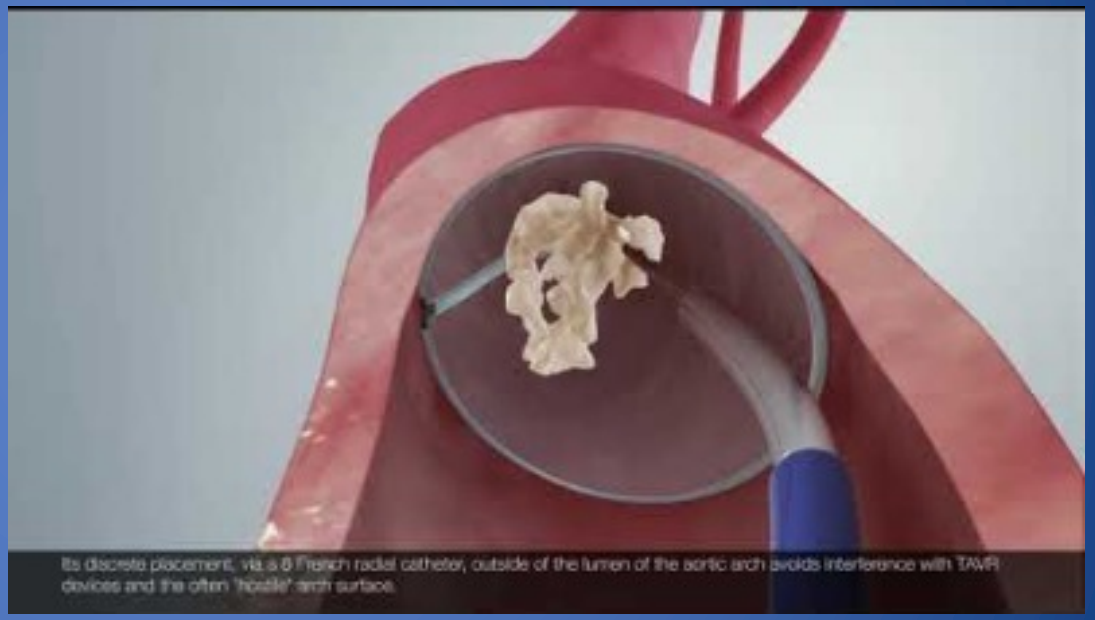
TAVR vs SAVR


All-cause mortality
Trial
HR (95% CI)
P
PARTNER 1A
0.90 (0.71 - 1.15)
US CoreValve high risk
0.79 (0.61 - 1.01)
NOTION
0.72 (0.33 - 1.59)
PARTNER 2A
0.92 (0.74 - 1.13)
SURTAVI
0.98 (0.72 - 1.34)
PARTNER 3
0.41 (0.14 - 1.17)
Evolut low risk
0.83 (0.41 - 1.67)
Overall
0.88 (0.78 - 0.99)
0.030
(Heterogeneity τ²<0.001, p = 0.727)
0.2
0.5
1
2
5
Favours TAVI
Favours SAVR

TAVR vs SAVR

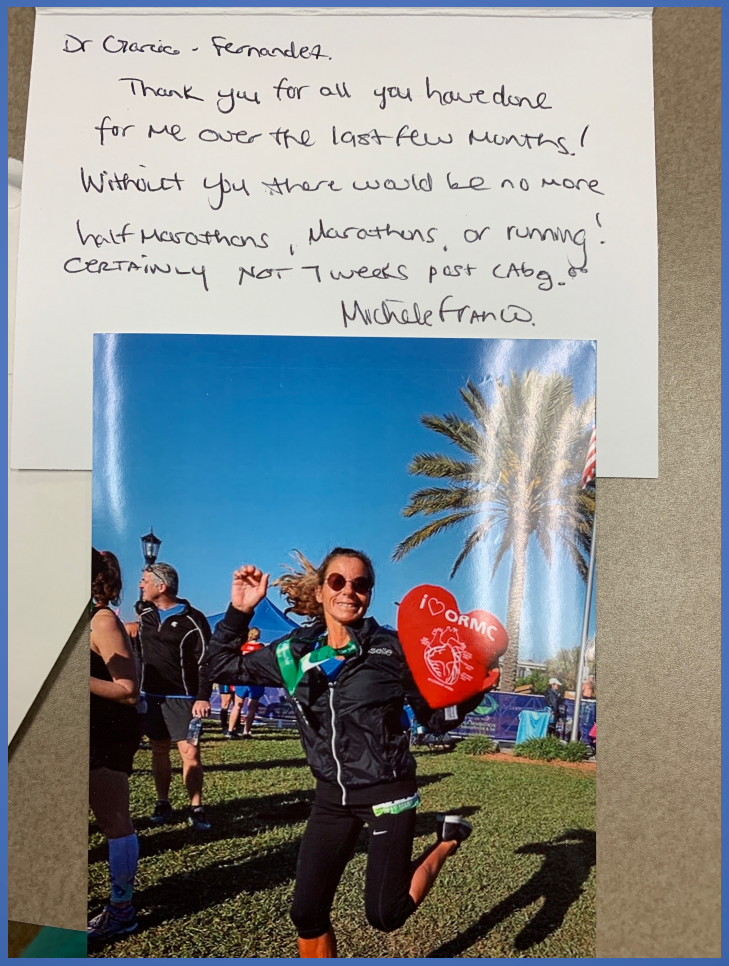

Any- and disabling stroke
Trial
HR (95% CI)
P
Any stroke
PARTNER 1A
1.22 (0.67 - 2.23)
US CoreValve high risk
0.70 (0.48 - 1.04)
NOTION
0.65 (0.21 - 2.05)
PARTNER 2A
0.93 (0.65 - 1.33)
SURTAVI
0.74 (0.51 - 1.07)
PARTNER 3
0.38 (0.15 - 1.00)
Evolut low risk
0.95 (0.56 - 1.63)
Overall
0.81 (0.68 - 0.98)
0.028
(Heterogeneity τ²<0.001, p = 0.416)
Disabling stroke
PARTNER 1A
1.87 (0.76 - 4.64)
US CoreValve high risk
0.76 (0.46 - 1.28)
PARTNER 2A
0.98 (0.69 - 1.38)
SURTAVI
0.58 (0.32 - 1.04)
PARTNER 3
0.22 (0.03 - 2.00)
Evolut low risk
0.38 (0.14 - 1.04)
Overall
0.78 (0.53 - 1.14)
0.192
(Heterogeneity τ²=0.094, p = 0.097)
0.1
0.2
0.5
1
2
5
10
Favours TAVI
Favours SAVR

Stroke protection



https://youtu.be/AAS_U6txglQ

Post Low Risk



Conclusion

- The PARTNER 3 and Evolut low risk trials show that TAVR is associated with significantly lower incidence of disabling stroke, bleeding complications, acute kidney injury, and atrial fibrillation, but higher rates of aortic regurgitation and need for permanent pacemaker implantation, particularly with self-expanding valves, and similar mortality. Based largely on the results of these two trials, the FDA approved the use of TAVR in low-risk patients earlier in 2019, permitting use of the SAPIEN S3 and the CoreValve Evolut R and Evolut Pro valves.
- Continued long-term clinical and echocardiographic follow-up will be crucial to definitively understand the durability of transcatheter heart valves and their different modes of failure. The results of imaging substudies will be very important to clarify the prognostic relevance of HALT.
- In conclusion, in light of the results of the PARTNER 3 and Evolut low risk trials, the choice between transcatheter and surgical treatment for low-risk patients with aortic stenosis should be individualized, based on patient preference, anatomic factors, local surgical expertise and outcomes, underlying conduction abnormalities, and presence of comorbidities. It is clear that TAVR has a definite role in the management of these patients.

THANK YOU