Transcatheter Valve Replacement: Current State in 2017

Marc A. Sintek MD
Assistant Professor of Medicine
Interventional Cardiology
Cardiovascular Division
Washington University in St. Louis

Missouri ACP 2017 CME Meeting
Updates in Internal Medicine
September 17, 2017

Disclosures: Consultant Volcano Corporation
Overview

- A Standard TAVR Case
- Evidence review and update for TAVR
- Evaluating Patients for TAVR
- Future of TAVR and unique TAVR populations
- Mitral valve therapies
- Complex TAVR Case
Case XX
The Evidence for TAVR

- The original data (PARTNERS)
- Intermediate Risk Patients
- Durability and Safety updates

CoreValve Evolute R

Sapien S3
Brief history of TAVR

Alain Cribier:
First human transcatheter valve replacement (2002)

Slide Courtesy Edwards Life Sciences
Brief history of TAVR

- **Landmark PARTNER clinical trials begin**
- **2010**: Edwards SAPIEN valve
- **2011**: Edwards SAPIEN valve
- **2012**: SAPIEN valve approved for high-risk patients
- **2014**: Edwards SAPIEN XT valve
- **2015**: SAPIEN 3 valve approved for intermediate or greater risk patients
- **2016**: SAPIEN 3 and SAPIEN XT valves approved for intermediate or greater risk patients

Slide Courtesy Edwards Life Sciences
Brief history of TAVR

PARTNERS Cohort B
(Inoperable)

PARTNERS Cohort A
(High Risk)

Hazard ratio, 0.55 (95% CI, 0.40–0.74)
P < 0.001

Hazard ratio, 0.93 (95% CI, 0.71–1.22)
P = 0.62

No. at Risk
TAVI Standard therapy
179 179
138 121
122 83
67 41
67 12

No. at Risk
Transcatheter Surgical
348 351
298 252
260 236
147 139
67 65

**Brief history of TAVR**

**CoreValve**
- **Pivotal Trial** (High Surgical Risk)
- **Extreme Risk Trial** (Inoperable)

**Brief history of TAVR**

**Low mortality and stroke rates**
Patient selection, procedural techniques, device evolution

- **RetroFlex 3 delivery system**
- **NovaFlex delivery system**
- **Edwards Commander delivery system**

**Improved vascular access**
Lower profile devices expands treatment possibilities

- **RetroFlex 3 introducer sheath 22F**
- **Edwards eSheath introducer set 16F**
- **Edwards eSheath introducer set 14F**

**Increased treatment range**
Larger and smaller valves

- **SAPIEN valve 23 mm and 26 mm**
- **SAPIEN XT valve 23 mm, 26 mm, 29 mm**
- **SAPIEN 3 valve 20 mm, 23 mm, 26 mm, 29 mm**

*Only used with 20 mm, 23 mm, 26 mm valve sizes

Slide Courtesy Edwards Life Sciences
Brief history of TAVR

- **2010**: Landmark PARTNER clinical trials begin
- **2011**: Edwards SAPIEN valve
- **2012**: SAPIEN valve approved for high-risk patients
- **2014**: Edwards SAPIEN XT valve
- **2015**: Edwards SAPIEN 3 valve
- **2016**: SAPIEN 3 and SAPIEN XT valves approved for intermediate or greater-risk patients
• 2032 patients with STS score between 4-8%.
• PCI/CABG allowed
• Sapein XT valve
236 patients (11%) were transthoracic TAVR.
PARTNER II

LEAK is BAD

Death from Any Cause, According to Severity of Paravalvular Aortic Regurgitation

Overall P=0.001 by log-rank test
Hazard ratio for mild vs. none or trace, 0.95 (95% CI, 0.63–1.45); P=0.82
Hazard ratio for moderate or severe vs. none or trace, 2.85 (95% CI, 1.57–5.21); P<0.001

No. at Risk
None or trace 701 678 664 647 628 621 612 605 585
Mild 210 204 199 194 188 184 182 180 175
Moderate or severe 36 32 32 26 26 24 22 22 21
The PARTNER IIA and S3i Trial
Study Design

Intermediate-Risk Symptomatic Severe Aortic Stenosis

Intermediate-Risk Assessment by Heart Team

PII S3i
n = 1078

ASSESSMENT: Optimal Valve Delivery Access

Transfemoral (TF)

TF TAVR SAPIEN 3

Transapical / Transaortic (TA / TAo)

TA / TAo TAVR SAPIEN 3

PIIA
n = 2032

ASSESSMENT: Transfemoral Access

Yes

Transfemoral (TF)

TF TAVR SAPIEN XT

1:1 Randomization

No

Transapical / Transaortic (TA / TAo)

TA / TAo TAVR SAPIEN XT

1:1 Randomization

Surgical AVR

Surgical AVR
Number at Risk:

- Surgery (PIIA): 944, 859, 836, 808, 795
- TAVR with SAPIEN 3 Valve: 1077, 1043, 1017, 991, 963

All-Cause Mortality (%):
- Surgery (PIIA): 0, 1.1%, 4.0%, 13.0%
- TAVR with SAPIEN 3 Valve: 0, 1.1%, 4.0%, 7.4%

*The PARTNER II trial intermediate-risk cohort unadjusted clinical event rates.

Slide Courtesy Edwards Life Sciences
PARTNER II S3i Leak

Number of Echos:
- Surgery: 755
- SAPIEN 3 TAVR: 992

30 Days:
- PARTNER II S3i Trial SAPIEN 3 Valve: 3.8%
- PARTNER IIA Trial Surgery: 0.5%
- PARTNER II S3i Trial SAPIEN 3 Valve: 1.5%
- PARTNER IIA Trial Surgery: 0.3%

1 Year:
- PARTNER II S3i Trial SAPIEN 3 Valve: 0%
- PARTNER IIA Trial Surgery: 0%

Severe
- Moderate
- Mild
- None / Trace

Slide Courtesy Edwards Life Sciences
• 1746 patients
• STS score 3-15% but heart team agreed intermediate risk (mean STS score was 4%).
• Corevavle 84% (Evolute R 16%).
SURTAVI 30 day Outcomes

<table>
<thead>
<tr>
<th></th>
<th>TAVR</th>
<th>SAVR</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>All cause death</td>
<td>2.2%</td>
<td>1.7%</td>
<td>No</td>
</tr>
<tr>
<td>Any Stroke</td>
<td>3.4%</td>
<td>5.6%</td>
<td>No</td>
</tr>
<tr>
<td>Pacemaker</td>
<td>25.9%</td>
<td>6.6%</td>
<td>Yes</td>
</tr>
<tr>
<td>Vascular Complication</td>
<td>6.0%</td>
<td>1.1%</td>
<td>Yes</td>
</tr>
</tbody>
</table>

PARTNER I- 5 year
TVT Registry

42,998 implants from 2011-2015
62% had STS <8% (intermediate)

JACC 2017. 70: 29-41.
TVT Registry

The TAVR Evaluation

- Understanding risk and STS score
- TAVR diagnostic testing
- “Cohort C”
- The heart team
The TAVR Evaluation

1. Does the patient have Severe AS?
2. Is the patient having symptoms of severe aortic stenosis?
3. What is the best treatment?
The TAVR Evaluation

http://riskcalc.sts.org
The TAVR Evaluation

**RISK LEVEL**

<table>
<thead>
<tr>
<th>STS Risk of Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low</strong></td>
</tr>
<tr>
<td>&lt;3%</td>
</tr>
<tr>
<td><strong>Intermediate</strong></td>
</tr>
<tr>
<td>4-8%*</td>
</tr>
<tr>
<td><strong>High</strong></td>
</tr>
<tr>
<td>&gt;8%</td>
</tr>
<tr>
<td><strong>Extreme</strong></td>
</tr>
<tr>
<td>&gt;15%</td>
</tr>
</tbody>
</table>

**RF-Chronic Lung Disease**

Indicate whether the patient has chronic lung disease, and the severity level according to the following classification: No, Mild: FEV1 60% to 75% of predicted, and/or on chronic inhaled or oral bronchodilator therapy. Moderate: FEV1 50% to 59% of predicted, and/or on chronic steroid therapy aimed at lung disease. Severe: FEV1 < 50 or Room Air pCO2 > 50. O1 deficit, severity not documented. Unknown: A history of chronic inhalation reactive disease (asthma, emphysema, black lung disease or pneumoconiosis) may qualify as chronic lung disease. Radiation induced pneumonitis or radiation fibrosis also qualifies as chronic lung disease. (If above criteria is met) A history of atelectasis is a transient condition and does not qualify. Chronic lung disease can include patients with chronic obstructive pulmonary disease, chronic bronchitis, or emphysema. It can also include a patient who is currently being chronically treated with inhaled or oral pharmacological therapy (e.g., beta-adrenergic agonist, anti-inflammatory agent, leukotriene receptor antagonist, or steroid). Patients with asthma or seasonal allergies are not considered to have chronic lung disease.
The TAVR Evaluation

- Consultation with 1 cardiologist and 2 cardiac surgeons
- Echocardiogram
- Coronary angiogram
- Pulmonary function testing
- Carotid Dopplers
- TAVR protocol CT (gated CT with 1mm slices of the heart, chest, abdomen and pelvis)
- Fraility Evaluation
The CT is King
“Cohort C”

High Risk Patients in the PARTNER Trial - 1 Year Outcomes

- Survival
  - Alive
  - Dead

- Survival & NYHA
  - Alive and NYHA I
  - Dead or NYHA III/IV

- Survival & QoL
  - Alive and ↑'d QoL
  - Dead or No ↑'d QoL

Prohibitive Risk Patients in the PARTNER Trial - 1 Year Outcomes

- Survival
  - Alive
  - Dead

- Survival & NYHA
  - Alive and NYHA I
  - Dead or NYHA III/IV

- Survival & QoL
  - Alive and ≥ Moderately ↑'d QoL
  - Dead or < Moderately ↑'d QoL
“Cohort C”
The Heart Team Concept

Cardiology

1. Cardiologist
2. Cardiac Surgeon
3. Interventional Cardiologist
4. Non-invasive imaging specialist
5. Cardiac Anesthesia
6. Cardiac Rehab Specialist
7. Nursing Specialist/Coordinator

Surgery

PATIENT

ANATOMY

RISK
The Unique “TAVR”

- Valve in Valve
- Pulmonic valve
Valve in Valve

Common Surgical Valves

Valve Failure

Perimount (Edwards)  Magna (Edwards)  Mosaic (Medtronic)  Hancock II (Medtronic)

Mitroflow (Sorin)  Trifecta (St. Jude Medical)  Epic (St. Jude Medical)

A  B  C

Wear and tear  Calcification  Pannus

D  E

Endocarditis  Thrombus
Valve in Valve

Global ViV registry
202 patients
93% Success rate
Valve in Valve

A. Changes in hemodynamics

B. Changes in function and quality of life

Valve in Mitral

CASE
Pulmonic Valve Replacement

CASE
Future of TAVR

- Low Risk Trial PARTNER 3 (Corevalve low Risk) currently enrolling.
- Bicuspid Valve disease.
- PCI/TAVR versus AVR/CABG.
- Moderate AS in setting of LV dysfunction (TAVR-UNLOAD).
Transcatheter Mitral Valve Therapies

- Mitral Clip
- New valve replacement technologies
- New valve “repair” technologies

Carpentier Classification of mitral regurgitation
Mitraclip

- FDA approved for treatment of “degenerative” mitral valve disease in those at high surgical risk
- High risk: >6% mitral valve repair or >8% for replacement
- COAPT trial: treatment of functional MR in patients with LV dysfunction
- Continued Access COAPT registry
Mitraclip

CASE
TMVR

- Mitral valve position
- Valve sealing
- Obstruction of the LV outflow tract
- Delivery system
- Anchoring and retention
- Complex mitral valve anatomy
TMVR
Case XX
Conclusion

• Transcatheter aortic valve replacement has been transformative for the care of patients with Severe AS.
• Refinements in technology has improved care.
• Mitral Valve disease is the new frontier in structural heart disease.
Questions

Marc A. Sintek MD
Assistant Professor of Medicine
Interventional Cardiology
Cardiovascular Division
Washington University in St. Louis

msintek@wustl.edu
314-747-3617