Transcatheter Aortic Valve Replacement: Current Practice and Future Scope

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Pinak B. Shah, MD
Director, Cardiac Catheterization Laboratory
Section Chief, Interventional Cardiology
Brigham and Women’s Hospital
Associate Professor of Medicine
Harvard Medical School
Case

- 63-year-old woman
- Fatigue and dyspnea
- Echo: Vmax 4.7 m/s, MG 49 mmHg
- STS 0.9%
- No CAD
- Referred to BWH Valve Center
- “You will get a new heart valve through the leg and go home the next day!”
2020 ACC/AHA Valvular Heart Disease Guidelines
<table>
<thead>
<tr>
<th>Trial</th>
<th>Year</th>
<th>Device</th>
<th>Risk</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARTNER B</td>
<td>2010</td>
<td>Sapien</td>
<td>Inop</td>
<td>TAVR &gt; Medical Therapy</td>
</tr>
<tr>
<td>PARTNER A</td>
<td>2011</td>
<td>Sapien</td>
<td>High</td>
<td>TAVR non-inf to SAVR</td>
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<tr>
<td>Corevalve XR</td>
<td>2014</td>
<td>Corevalve</td>
<td>Inop</td>
<td>TAVR &gt; Performance Goal</td>
</tr>
<tr>
<td>Corevalve HR</td>
<td>2014</td>
<td>Corevalve</td>
<td>High</td>
<td>TAVR non-inf to SAVR, possibly superior</td>
</tr>
<tr>
<td>PARTNER 2</td>
<td>2016</td>
<td>Sapien XT</td>
<td>Intermed</td>
<td>TAVR &gt; SAVR for TF candidates</td>
</tr>
<tr>
<td>Sapien 3 HR</td>
<td>2016</td>
<td>Sapien 3</td>
<td>High/Inop</td>
<td>Low Event Rates for SAVR</td>
</tr>
<tr>
<td>Sapien 3 IR</td>
<td>2016</td>
<td>Sapien 3</td>
<td>Intermed</td>
<td>TAVR &gt; SAVR</td>
</tr>
<tr>
<td>SURTAVI</td>
<td>2017</td>
<td>Corevalve &amp; Evolut R</td>
<td>Intermed</td>
<td>TAVR non-inf to SAVR</td>
</tr>
<tr>
<td>PARTNER 3</td>
<td>2019</td>
<td>Sapien 3</td>
<td>Low</td>
<td>TAVR &gt; SAVR</td>
</tr>
<tr>
<td>Corevalve Low Risk</td>
<td>2019</td>
<td>Corevalve Evolut R</td>
<td>Low</td>
<td>TAVR non-inf to SAVR</td>
</tr>
</tbody>
</table>
Current Practice: TAVR vs. SAVR 2022

SAVR TAVR Universe Slide 2012-2020

[Graph showing the comparison of SAVR and TAVR procedures from 2012 to 2020, with data points and trends indicating the number of procedures performed each year.]
Future Scope: What do We Need to Learn/Improve?

• Bicuspid aortic valve
• THV Durability
• Coronary Access
• Managing THV Failure—”Lifetime Management”
• Paravalvular Regurgitation
• Pacemaker
• Stroke
• Leaflet Thrombosis
TAVR and Bicuspid Aortic Valve

Hayashida et al. Circ Cardiovasc Interv 2013
TAVR and Bicuspid Aortic Valve

JAMA 2021
TAVR and Bicuspid Aortic Valve

Death From Any Cause, According to Morphological Features

- No Calcified Raphe or Excess Leaflet Calcification (11.3%)
- Calcified Raphe or Excess Leaflet Calcification (24.8%)
- Calcified Raphe Plus Excess Leaflet Calcification (26.0%)

All-cause Mortality (%)

Days

p < 0.001 log-rank

0 180 360 540 720

None

Calcified raphe or excess leaflet calcification

Calcified raphe and excess leaflet calcification

25.7

13.6

4.6

3.8

9.5

5.9
Insights from VIVID Registry

Median time to VIV TAVR: 8-9 years
TAVR Durability

Potential Reasons for Reduced Durability
• TAVR valves are compressed before delivery
• TAVR valves may be post-dilated
• TAVR may be deployed non-circularly

Potential Reasons for Improved Durability
• TAVR valves have larger EOA than SAVR valves
• TAVR valves hemodynamics are generally better than SAVR valves

OD = 23 mm
ID = 21 mm
23 mm CE Magna (SAVR)

OD = ID = 23 mm
23 mm Sapien 3 (TAVR)
DURABILITY

Durability Data in RCT

PARTNER 2 - 5 Year

NOTION - 8 Year

SURTAVI - 5 Year
Coronary Access after TAVR
Newer THV Designs

- Future Generation Sapien (Edwards)
- Radio-opaque Commisural Tabs
- Wider Superior Cells
- Acurate NEO (Boston Scientific)
- JenaValve (JenaValve)
Redo TAVR?

“Russian Doll Effect”

First TAVR

Second TAVR (green) pins open leaflets of first TAVR (red arrows)

Circulation Cardiovascular Interventions 2020
Surgical Explantation of Transcatheter Aortic Bioprostheses
An Analysis From the Society of Thoracic Surgeons Database
LIFETIME MANAGEMENT

Lifetime Mgmt AS in Patients < 65

**CENTRAL ILLUSTRATION**
Risks and Benefits of 3 Potential Strategies in the Lifetime Management of Severe Aortic Stenosis in Young Patients

**SAVR-TAVR-TAVR**
- **Benefit**
  - Well established TAVR-in-SAVR
  - Feasibility of coronary access after SAVR
  - Surgery at young age
- **Risk**
  - Few options for fourth procedure
  - Difficult coronary access after TAVR-in-SAVR
  - High risk for coronary obstruction with TAVR-in-TAVR

**TAVR-SAVR-TAVR**
- **Benefit**
  - Feasible fourth procedure
  - TAVR in SAVR is feasible as a third procedure
  - Minimally invasive procedure at young age
- **Risk**
  - Limited experience with TAVR explantation
  - Need for concomitant aortic repair

**TAVR-TAVR-TAVR**
- **Benefit**
  - Minimally invasive procedure at young age
- **Risk**
  - High risk of coronary obstruction with TAVR-in-TAVR
  - Difficult coronary access
  - Feasible only in few patients


SAVR — surgical aortic valve replacement; TAVR — transcatheter aortic valve replacement.
Conclusion

• Short-term outcomes with TAVR in low-risk patients are excellent.
• However, a paucity of data exists in patients < 65
• Unknowns: bicuspid anatomy, durability, coronary concerns, optimal lifetime management.
• Patients will generally opt for TAVR.
• Careful Heart Team assessment critical to ensure best course of action is selected and patient/family fully understands consequences of decision.
Case

- Patient did prefer TAVR
- Careful discussion regarding unknowns
- Careful discussion about anatomic concerns of TAVR in bicuspid anatomy
- Heart Team felt that despite being feasible, TAVR would not definitely provide as good of a result as SAVR
- Ultimately recommended SAVR