Alternative Access Considerations for Transcatheter Valve Replacement

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In the beginning there were just two…

Transfemoral

Transapical
Multiple Access Options

- Transfemoral Approach
- Transapical Approach
- Transaortic Approach
Is there an ideal route of access?

- **Low Risk**
  - STS < 4
  - AVR

- **Moderate Risk**
  - STS > 4
  - Investigational Trials

- **High Risk**
  - STS > 8
  - Commercial

- **Inoperable**
  - Morbidity > 50%
  - TAVR-TA, TAVR-TA, TAVR-TF
Transapical TAVR

- Ease of positioning
  - Straight line approach
  - Not effected by STJ narrowing
  - Less manipulation of the aortic arch
- Not limited by arterial access issues
- 15-30% of patients require this approach
Transapical TAVR Animation
Transapical TAVR

Walther et al.
Transapical TAVR
Transapical TAVR
# PARTNER TRIAL

## Transfemoral vs Transapical

<table>
<thead>
<tr>
<th></th>
<th>Transfemoral (n=492)</th>
<th>Transapical (n=207)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>84.4 ± 6.7</td>
<td>83.2 ± 6.5</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>STS score</strong></td>
<td>11.7 ± 3.3</td>
<td>11.8 ± 3.5</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>NYHA III/IV (%)</strong></td>
<td>94</td>
<td>95</td>
<td>0.94</td>
</tr>
<tr>
<td><strong>Prior CABG (%)</strong></td>
<td>39</td>
<td>53</td>
<td>0.001</td>
</tr>
<tr>
<td><strong>Prior MI (%)</strong></td>
<td>26</td>
<td>33</td>
<td>0.08</td>
</tr>
<tr>
<td><strong>Cerebrovascular Disease (%)</strong></td>
<td>25</td>
<td>36</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Peripheral Vascular Disease (%)</strong></td>
<td>35</td>
<td>60</td>
<td>0.001</td>
</tr>
<tr>
<td><strong>Atrial Fibrillation (%)</strong></td>
<td>39</td>
<td>51</td>
<td>0.05</td>
</tr>
<tr>
<td><strong>Creatinine &gt; 2 (%)</strong></td>
<td>10</td>
<td>8</td>
<td>0.5</td>
</tr>
</tbody>
</table>
TAVR-Transfemoral and Transapical

• TAVR-TF and TAVR-TA are complimentary procedures dealing with two distinct populations with specific comorbidities.

• The PARTNER trial was neither powered or randomized to answer this question.
# Transfemoral vs Transapical Mortality

<table>
<thead>
<tr>
<th>Study</th>
<th>30 day</th>
<th>1 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Himbert, et al. (6)</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>Femoral, n=51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apical, n=24</td>
<td>8 (16*)</td>
<td>20</td>
</tr>
<tr>
<td>Rodes-Cabau, et al. (7)</td>
<td>9.5</td>
<td>25</td>
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<tr>
<td>Femoral, n=168</td>
<td></td>
<td></td>
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<tr>
<td>Apical, n=177</td>
<td>11.3</td>
<td>22</td>
</tr>
<tr>
<td>Thomas, et al. (8,9)</td>
<td>6.3</td>
<td>18.9</td>
</tr>
<tr>
<td>Femoral, n=463</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apical, n=575</td>
<td>10.3</td>
<td>27.9</td>
</tr>
<tr>
<td>Ewe, et al. (10)</td>
<td>11.1</td>
<td>19.8</td>
</tr>
<tr>
<td>Femoral, n=45</td>
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<tr>
<td>Apical, n=59</td>
<td>8.5</td>
<td>14.3</td>
</tr>
<tr>
<td>Lefevre, et al. (11)</td>
<td>8.2</td>
<td>21.3</td>
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<td>Femoral, n=61</td>
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<td>Apical, n=69</td>
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<td>50.7</td>
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<tr>
<td>Mcoat, et al. (12)</td>
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<tr>
<td>Femoral, n=599</td>
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<tr>
<td>Nonfemoral, n=271</td>
<td>10.7</td>
<td>27.7</td>
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<tr>
<td>Gilard, et al. (13)</td>
<td>8.5</td>
<td>21.7</td>
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<tr>
<td>Femoral, n=2293</td>
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</tr>
<tr>
<td>Apical, n=567</td>
<td>13.9</td>
<td>32.3</td>
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</table>
# Transfemoral vs Transapical Stroke

<table>
<thead>
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<tr>
<td>Himbert, et al. (6)</td>
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</tr>
<tr>
<td>Femoral</td>
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<td></td>
</tr>
<tr>
<td>Apical</td>
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<td></td>
</tr>
<tr>
<td>Rodes-Cabau, et al. (7)</td>
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<td></td>
</tr>
<tr>
<td>Femoral</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Apical</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>Thomas, et al. (8,9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Femoral</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Apical</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>Ewe, et al. (10)</td>
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<td></td>
</tr>
<tr>
<td>Femoral</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>Apical</td>
<td>3.4</td>
<td></td>
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<td>Lefevre, et al. (11)</td>
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<tr>
<td>Apical</td>
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<td>7</td>
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<tr>
<td>Moat, et al. (12)</td>
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<tr>
<td>Femoral</td>
<td>4</td>
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<tr>
<td>Nonfemoral</td>
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<td>Giliard, et al. (13)</td>
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<tr>
<td>Apical</td>
<td>4.4</td>
<td></td>
</tr>
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</table>

Gaasch et al.
Transfemoral vs Transapical Stroke

Khalert et al.

Miller et al.
Disadvantages of Transapical TAVR

- Requires a small thoracotomy
- Requires a ventriculotomy
- Increased bleeding potential
- Longer recovery
- Non-trivial learning curve

Mohr et al.
Disadvantages of Transapical TAVR

- Early apical dysfunction
- No apical dysfunction

Barbash et al.
The Poor Transapical TAVR Candidate

- Severe COPD
- No previous sternotomy
- Immunocompromised
- Significantly ↓ ejection fraction
Transaortic TAVR

• Mini-sternotomy incision
• Avoids TAVR-TA risks
  • Bleeding
  • Ventricular dysfunction
  • Less pulmonary dysfunction
• Preserves the advantages of TA: ease of positioning, avoidance of arch manipulation
• Can be safely performed in most patients
Transaortic TAVR
Transaortic TAVR
Transaortic TAVR
Transaortic TAVR-Redo Sternotomy
Transaortic TAVR-Redo Sternotomy
TAVR-TAo Operating Room Setup
Mini-J Sternotomy

CRIMPING TABLE (>130 cm)

CS = Cardiac Surgeon
IC = Interventional Cardiologist
A = Cardiac Anesthesiologist
E = Cardiac Echocardiographer
N = Nurse

MONITOR 1
MONITOR 2
RAPID PACER
SURGICAL EQUIPMENT
BRIDGE CIRCUIT
ECHOCARDIOGRAPHY
Is there an ideal route of access?

- **Low Risk**
  - STS < 4
  - AVR

- **Moderate Risk**
  - STS > 4
  - PARTNER II

- **High Risk**
  - STS > 8
  - Commercial

- **Inoperable Morbidity > 50%**
  - TAVR-TAo
  - TAVR-TA
  - TAVR-TF
  - TAVR-TAo
  - TAVR-TF
  - TAVR-TA
Special Circumstances

• Degenerated aortic valve prostheses

• Mitral procedures
  • Valve in valve
  • Valve in ring
  • Native mitral stenosis
Special Circumstances
Special Circumstances
Special Circumstances
TAVR Conclusion

- Transapical and transfemoral approaches remain complementary approaches and have their unique advantages and disadvantages.

- A transfemoral-first strategy has been adopted at most US institutions and TF implantation remains the most commonly used approach around the world.

- The availability of smaller, lower profile sheaths will increase the number of patients who are candidates for a TF approach.
TAVR Conclusion

- Transaortic procedures will play an increasing role in the future and overcome some of the problems associated with TA insertion.

- TAVR physicians need to be familiar with all approaches and should tailor the implant strategy to the particular patient.
Washington University TAVR Experience

- **PARTNER I**
  - Transapical 55
  - Transfemoral 45

- **PARTNER II**
  - Transapical 29
  - Transfemoral 49
  - Transaortic 16
  - Valve in Valve 11 (5TA, 6TF)

- **Commercial**
  - Transfemoral 33
  - Transapical 22
  - Transaortic 29
Washington University TAVR Volume
Future directions

- Reducing stroke
Future directions

• Reducing stroke
• Eliminating paravalvular leaks
Future directions

- Reducing stroke
- Eliminating paravalvular leaks
- Reimbursement
Future directions

Patient Selection
Some patients may not be suitable THV candidates

There has been a recognition by practitioners as well as the FDA and CMS that TAVR should not be offered to these patients in whom valve replacement may not positively impact their quantity and quality of life.

“There are those who die of aortic stenosis vs. those who die with aortic stenosis”
It’s a team effort…

- Cardiologists
- Cardiac Surgeons
- Anesthesiologists
- Hybrid OR team
- RN’s and ANP’s
- Research nurses
Thank you for your attention.