Recovery of Left Ventricular Mechanics Following Transcatheter Aortic Valve Implantation: Long-term Follow-up in Patients with Four Subtypes of Aortic Stenosis

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INTRODUCTION

- Left ventricular mechanics are impaired in patients with severe aortic stenosis (AS).
- Global longitudinal strain (GLS) may recover differentially after relief of AS and may help identify select patients who have a higher likelihood of survival post transcatheter aortic valve implantation (TAVI).

HYPOTHESIS

- We hypothesized there would be differences in myocardial mechanics (measured by GLS) following TAVI in patients with four subtypes of severe AS, and these differences could predict survival.

METHODS

- All patients undergoing TAVI from January 2011 – March 2016 who had pre and post TAVI GLS data available.
- Speckle-tracking transthoracic echocardiography using GE Vivid E9 and E95 platforms.
- Classified by peak velocity, mean aortic gradient, LVEF and stroke volume index as:
  1) Normal flow and high gradient
  2) Normal flow and gradient with low EF
  3) “Classic” low flow and low gradient (LFLGS)
  4) Paradoxical low flow and low gradient.

RESULTS

- Two hundred-eight patients with severe AS who underwent TAVI were analyzed (Table 1); 45 died during the 5 year study period
- No significant differences were noted in age or comorbidities. “Classic” low flow low gradient stenosis patients were more likely men
- GLS measured pre-TAVI and 0-30 days post TAVI (99% of patients, 2 patients with 30-90 day GLS assessment). (Table 2)
- Both GLS (-14.0 ± 4 to -15.0 ± 4.3, p<0.0001) and LVEF (56 ± 14% to 58 ± 15%, p=0.0003) improved significantly post TAVI.
- Across all types of AS, improvement in GLS associated with a survival benefit, with GLS recovery in alive patients (mean GLS pre-TAVI -14.2 ± 4.1 and post-TAVI -15.2 ± 4.1, p<.001) and no significant recovery in deceased patients (mean GLS pre-TAVI -14.1 ± 4.2 and post-TAVI -14.2 ± 4.4, p=0.8858) (Figure 2)
- Patients with “classic” LFLGS showed no significant improvement post TAVI in GLS or LVEF, and had highest overall mortality rate.

CONCLUSIONS

- LVEF and GLS improved significantly post-TAVI
- “Classic” low flow, low gradient AS patients had lowest post-procedure GLS recovery and highest overall mortality in study period
- Across all types of AS, GLS recovery was noted in patients who survived, but not in patients who subsequently died.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Characteristics</th>
<th>Demographics</th>
<th>Overall (n=208)</th>
<th>1 (n=108)</th>
<th>2 (n=29)</th>
<th>3 (n=31)</th>
<th>4 (n=40)</th>
<th>P. value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>81.8 ± 10.1</td>
<td>81.4 ± 11.2</td>
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<td>83.1 ± 5.3</td>
<td>80.7 ± 9.7</td>
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<td>Female</td>
<td>113 (54.3%)</td>
<td>65 (60.2%)</td>
<td>17 (58.6%)</td>
<td>8 (25.8%)</td>
<td>23 (57.5%)</td>
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<td>STS Score</td>
<td>7.7 ± 5.0</td>
<td>8.5 ± 6.1</td>
<td>8.0 ± 3.7</td>
<td>7.6 ± 3.9</td>
<td>6.3 ± 3.2</td>
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<table>
<thead>
<tr>
<th>Table 2</th>
<th>Pre-TAVI</th>
<th>Post-TAVI</th>
<th>Alive (%)</th>
<th>Deceased (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVEF (%)</td>
<td>GLS</td>
<td>LVEF (%)</td>
<td>GLS</td>
<td>Alive (%)</td>
</tr>
<tr>
<td>1 (n=108)</td>
<td>62.5 ± 9.6</td>
<td>-15.3 ± 3.3</td>
<td>64.7 ± 8.1</td>
<td>-16.2 ± 3.7</td>
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<td>2 (n=29)</td>
<td>37.9 ± 9.7</td>
<td>-10.6 ± 3.2</td>
<td>44.8 ± 11.8</td>
<td>-12.3 ± 3.7</td>
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<td>3 (n=31)</td>
<td>37.3 ± 10.1</td>
<td>-10.1 ± 3.0</td>
<td>38.3 ± 13.3</td>
<td>-10.8 ± 3.4</td>
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<td>4 (n=40)</td>
<td>61.1 ± 8.7</td>
<td>-16.4 ± 3.6</td>
<td>63.0 ± 8.5</td>
<td>-17.1 ± 4.4</td>
</tr>
</tbody>
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Figure 1 – Change in GLS Normal Flow, High Gradient Severe AS

Pre-TAVI GLS -16.8%

Post-TAVI GLS - 18.0%

Figure 2 – GLS Recovery from pre-to-post TAVI and Survival

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