Use of Psoas Muscle Size as a Frailty Assessment Tool for Open and Transcatheter Aortic Valve Replacement

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Author Disclosures

- None
Background

• AVR is most common valve procedure in US

• Landmark studies evaluating TAVR have revolutionized treatment for patients deemed “inoperable” or at high risk for AVR

• High rates of 1 year mortality in these cohorts regardless of treatment
Background

• Concepts of frailty and futility have become increasingly important

• Frailty has been independently associated with higher risk for mortality and institutional care requirement after cardiac surgery

  - Lee DH et. al. Circulation 2010
Background

- Current risk assessment evaluates comorbidities not frailty

- Typical tests include:
  - “eyeball test”
  - Gait speed
  - Grip strength

- Subjective, effort dependent, cumbersome and therefore likely underutilized
Background

- Prior work has evaluated use of core muscle mass loss as a measure of frailty
- Uses routinely available CT scan testing to assess core muscle mass
- Sarcopenia is not subject to acute changes in health status or effort
- Measurement can be standardized

*Lee DH et. al JVS 2011*
Study Objective

To evaluate the use of core muscle loss (sarcopenia) as a frailty assessment tool in determining therapeutic options for aortic valve disease
Determination of Total Psoas Major Muscle Area

Inferior border L4

Patient A
STS 2.4%
TPA -1.7

Patient B
STS 2.4
TPA 2.1

University of Michigan Health System
Patients and Methods

- Inclusion criteria
  - Either AVR ± CABG or TAVR
  - Adequate preoperative CT scan (within 90 days) with imaging from L1 to L4
  - January 2011 through December 2013

- Primary endpoint: Late survival
Patients and Methods

710 Patients

SAVR (52.9%)

Excluded for inadequate CT scan (n=414)

TAVR (47.1%)
Overall AVR Clinical Profile

• Mean age 70.7 years
  • SAVR 70 yr vs. TAVR 79 yr: p<0.001

• Mean STS-PROM 4.4%
  • SAVR 3.0% vs. TAVR 6.5%: p<0.001

• Gender standardized total psoas area:
  • SAVR 0.25 above mean vs.
    TAVR -0.29 below mean: p<0.001
Relationship of Total Psoas Area to STS risk score

- R² = 0.0078
- R² = 0.0137
Total Psoas Area By Gender

- **TAVR**

- **SAVR**

Because of baseline differences between gender, TPA reported as number of standard deviations from gender specific mean.
Early Outcomes

- 30-day mortality
  - SAVR 0% vs. TAVR 4%: \( p=0.022 \)

- Stroke
  - SAVR 1% vs. TAVR 4%: \( p=0.154 \)

- Renal Failure (STS version 2.73)
  - SAVR 0% vs. TAVR 2%: \( p=0.1 \)
Early Poor Composite Outcome

• Composite measure of:

1) 30-day mortality
2) stroke
3) renal failure
4) prolonged ventilation
5) deep wound infection

• 25 patients (8.4%)
Early Poor Composite Outcome

<table>
<thead>
<tr>
<th>Independent predictors</th>
<th>OR</th>
<th>$p$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body mass index</td>
<td>1.1</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>STS M and M score</td>
<td>91.1</td>
<td>0.02</td>
</tr>
<tr>
<td>Tobacco use</td>
<td>5.0</td>
<td>0.03</td>
</tr>
<tr>
<td>Presence of mitral stenosis</td>
<td>7.8</td>
<td>0.03</td>
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<tr>
<td>Total psoas area</td>
<td>0.5</td>
<td>0.02</td>
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</table>
Late Survival—Entire Cohort

2 yr survival 91.9%
Late Survival According to Sarcopenia (lowest tertile)

Kaplan-Meier Survival Estimates by Sarcopenia

2 yr survival
Sarcopenia 85.7%
Non-sarcopenia 93.8%
p=0.02
## Late Survival

<table>
<thead>
<tr>
<th>Independent predictors</th>
<th>HR</th>
<th>p Value</th>
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</thead>
<tbody>
<tr>
<td>MI within 21 days</td>
<td>9.2</td>
<td>0.009</td>
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<tr>
<td>Total psoas area</td>
<td>0.5</td>
<td>0.02</td>
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</table>
High Resource Utilization

• Composite measure of:
  1) length of stay > 14 days
  2) ICU stay > 7 days
  3) readmission within 30 days

• 68 patients (23.1%)
## High Resource Utilization—Entire Cohort

<table>
<thead>
<tr>
<th>Independent predictors</th>
<th>OR</th>
<th>( p ) Value</th>
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<tbody>
<tr>
<td>Male gender</td>
<td>0.5</td>
<td>0.04</td>
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<tr>
<td>Presence of aortic insufficiency</td>
<td>0.4</td>
<td>0.01</td>
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<tr>
<td>Total psoas area</td>
<td>0.6</td>
<td>0.001</td>
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High Resource Utilization—Stratification by Treatment Type

• SAVR group
  - Total psoas area independently predictive (OR 0.4, \( p<0.001 \))

• TAVR group
  - Total psoas area not predictive (\( p=0.66 \))
High Resource Utilization Stratified By Sarcopenia and STS Score in SAVR Group Alone

- Sarco Hi STS: 66.7
- Sarco Lo STS: 37
- Non-sarco Hi STS: 21.7
- Non-sarco Lo STS: 19.1
Study Limitations

- Exclusion of fraction of initial cohort due to inadequate available imaging
- Need larger sample size and prospective analysis to determine differential effects on SAVR vs. TAVR mortality
- Sarcopenia does not evaluate other important cognitive and social aspects of frailty
Summary

1. CT scan derived assessment of sarcopenia as an easily obtained objective frailty test predicts early morbidity and mortality, high resource utilization and late survival after AVR.

2. Sarcopenia along with STS risk score is important predictor of high resource utilization after SAVR but not TAVR
Conclusion

Use of conventional risk calculators along with heart team evaluation and assessment for sarcopenia may provide optimal selection of therapy for aortic stenosis in transcatheter era.