Aortic valve calcium score indexed to transaortic valve gradient: A novel hemodynamic and anatomic index for patients with low gradient aortic stenosis.

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Aortic Valve Calcium Score Indexed to Transaortic Valve Gradient: A Novel Hemodynamic and Anatomic Index for Patients with Low Gradient Aortic Stenosis

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Abstract

Background
Aortic valve calcium score (AVCS) is a marker for aortic stenosis (AS) severity. We sought to evaluate the effect of aortic valve (AV) variables of flow defined by stroke volume index (SVI), area (AVA), and gradient (MG) on AVCS and study the role of AVCS/MG ratio in patients with low gradient AS.

Methods
We retrospectively studied patients undergoing transcatheter aortic valve replacement (TAVR) for severe AS (defined by Echo, Cath, and multimodality team consensus) at our institution from January 1, 2014 through September 1, 2018. AVCS was compared among patient groups defined by their MG (low < or high ≥40 mmHg), echocardiographic SVI (low < or normal ≥35 mL/m²), and AVA (< 0.8 or ≥0.8 cm²) using a three-way factorial ANOVA. The AVCS/MG ratio was developed and compared to AVCS and AVCS/cm² (annular area) to identify severe AS in patients with low gradient. AVCS/MG was developed based on AVSC (AU) 2000 in males, and 1600 in females/ 40 mmHg (50 and 30, retrospectively).

Results
Our analysis included 272 patients. AVCS was significantly higher in patients with high compared to low MG (3414.8 +/- 1819.57, 2596.0 +/- 1385.1, respectively p = 0.00004). There was no difference in the AVCS between normal and low flow (2883.0 +/- 1679.3, 3154 +/- 1679.5, respectively p = 0.188); and small and larger AVA (3098.1 +/- 1642.4, 2871 +/- 1789.8, respectively p = 0.330). In patients with low MG, the index AVCS/MG identified more patients with severe AS compared to AVCS or indexed AVCS to the annulus.
Conclusions
AVCS is significantly higher in those with severe AS and high MG regardless of flow state or AVA. Furthermore, AVCS/MG more accurately predicts severe AS compared to AVCS in LG AS.

Methods Utilized for the Classification of Severe Low Gradient Aortic Stenosis

<table>
<thead>
<tr>
<th>Patients with LG AS</th>
<th>AVCS$^1$ Correctly Classified</th>
<th>AVCS/Annular Area$^2$ Correctly Classified</th>
<th>AVCS/MG$^3$ Correctly Classified</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 125</td>
<td>97/125 (77.6%)</td>
<td>101/125 (80.8%)</td>
<td>118/125 (94.4%)</td>
</tr>
</tbody>
</table>

$^1$AVCS $\geq$ 2000 AU in men and $\geq$ 1200 AU in women
$^2$AVCS/cm$^2$ $\geq$ 500 AU/cm$^2$ in men and $\geq$ 300 AU/cm$^2$ in women
$^3$AVCS/MG $\geq$ 50 AU/mmHg in men and $\geq$ 30 AU/mmHg in women

Graphical representation of the distribution of AVCS with respect to gradient. There is a statistically significant difference in AVCS between LG and HG AS (p = 0.00004).

AVCS/MG was developed based on AVSC 2000 in males, and 1600 in females/ 40 mmHg. Hence 50 in males and 30 in females. AVCS/MG accurately classified patients with severe low-gradient aortic stenosis in 94.4% of cases.

Presenter

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Contractile Reserve as A Predictor of Improvement in Ejection Fraction in Low-Flow, Low-Gradient Severe Aortic Stenosis Following Transcatheter Aortic Valve Replacement

Outcomes of Trans-catheter Aortic Valve Replacement Among Patients with Low Gradient Severe Aortic Stenosis: Pairwise and Network Meta-analysis With Trial Sequential Analysis.

One-Year Outcomes Of Paradoxical Low Flow Severe Aortic Stenosis, Post TAVR.

Outcomes of Low-Risk Patients Undergoing Transcatheter Aortic Valve Replacement for Severe Aortic Stenosis: A Single Center Experience

Severe Aortic Valve Stenosis With a Large Sinus of Valsalva Aneurysm: Navigating the Risk of Transcatheter Aortic Valve Replacement