Alternative to the Agatston Score for Bicuspid Aortic Valve Calcium

Prognostic Equivalence to the Gold Standard

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Disclosure of Relevant Financial Relationships

I, Ken Chan, DO NOT have any financial relationships to disclose.

Background

- Why this matters: BAV stenosis generally presents with more ***severe calcification***. Yet patients often lack nc-CT for AVCS grading

- Gap: ce-CT calcium quantification exists, but not validated in BAV, and fixed thresholds misbehave with variable blood attenuation.

Objective

Develop a novel aortic valve calcium scoring methodology to produce Agatston-equivalent AVCS from ce-CT and to test ***prognostic equivalence*** *at 30 days and 1 year outcome.*

Methods

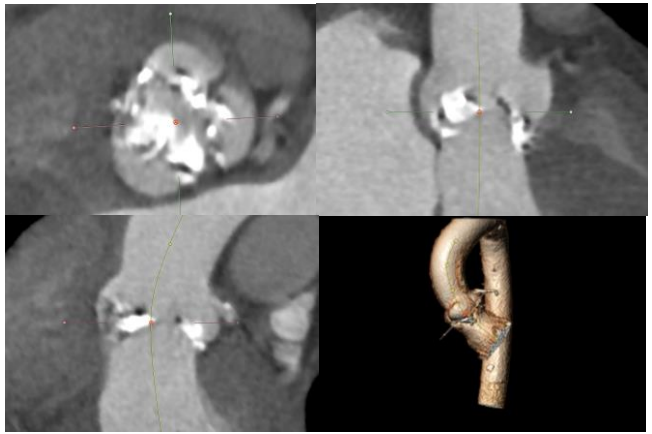
- Retrospective analysis
- Single Center - 2022–2024
  - Inclusion: Pre-TAVR imaging both nc-CT and ce-CT
  - Exclusion: Patients with prior aortic surgery, aortic dissections, prior pacemakers or inadequate imaging quality.
- 60 patients included in the final analysis

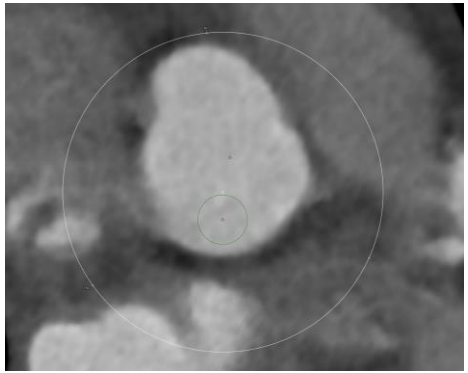
Calculation of the Agatston Score

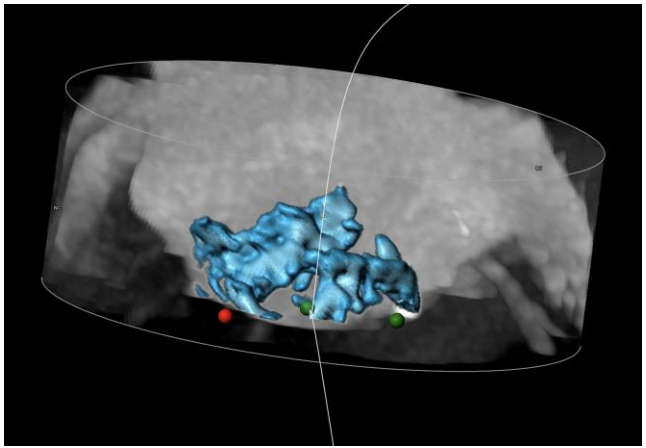
Agatston Lesion Score = Lesion Area x Density Weighting Factor
Total Agatston Score = Σ Lesion Scores

Versus

Luminal attenuation based stratification strategy







Method

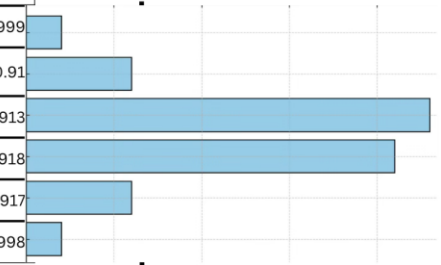
Screened n= 296

Final Cohort n=60

ce-CT n=60

nc-CT n=60

Group	Statistical Range	Detection Threshold (HU)	Conversion Factor (k)	R^2
1	< Mean to 2×Std	< 334	1.86	0.999
2	Mean minus 2×Std to Mean minus 1×Std	335 – 429	2.27	0.91
3	Mean minus 1×Std to Mean	430 – 526	2.58	0.913
4	Mean to Mean plus 1×Std	527 – 623	2.76	0.918
5	Mean plus 1×Std to Mean plus 2×Std	624 – 720	3.68	0.917
6	> Mean plus 2×Std	> 721	5.82	0.998



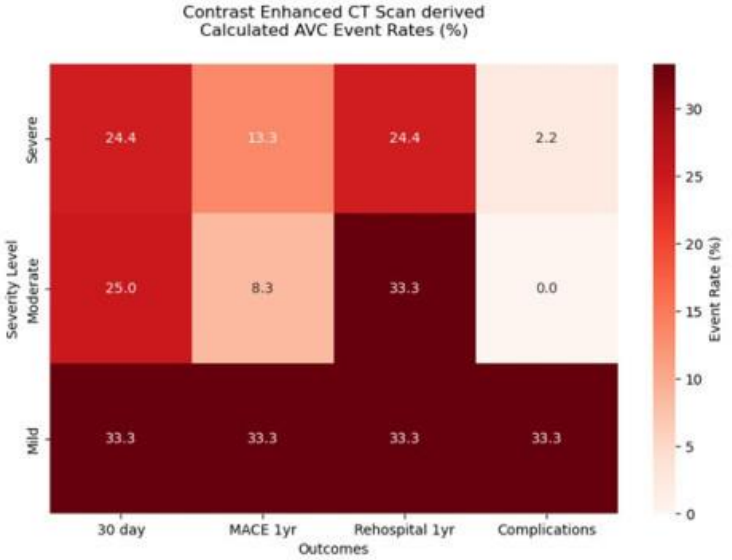
Severity	Women	Men
Mild	< 400	< 1000
Moderate	400 -1299	1000 - 1999
Severe	>/= 1300	>/= 2000

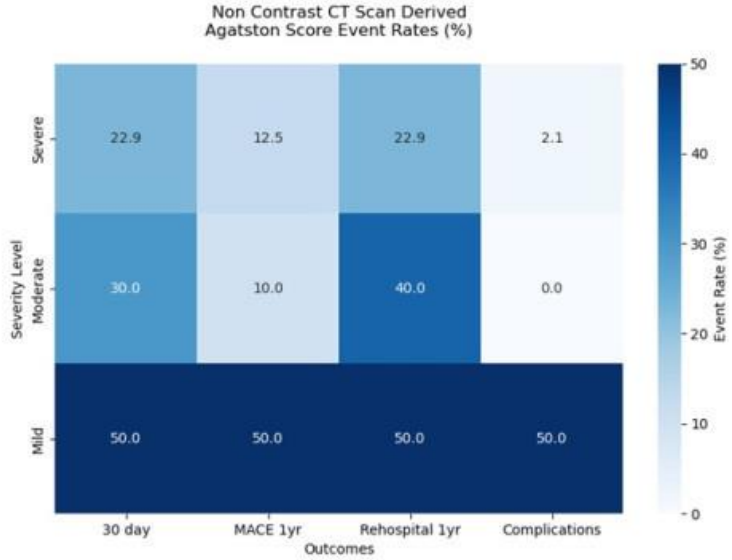
Calculated conversion factors for each stratified group

Group	Conversion Factor (k)	N	R^2	MAE[a] Percentage (%)
Group 1	1.86	2	0.999	1.2%
Group 2	2.27	6	0.910	2.1%
Group 3	2.58	22	0.913	4.8%
Group 4	2.76	21	0.918	1.7%
Group 5	3.68	6	0.917	2.6%
Group 6	5.82	2	0.998	1.1%

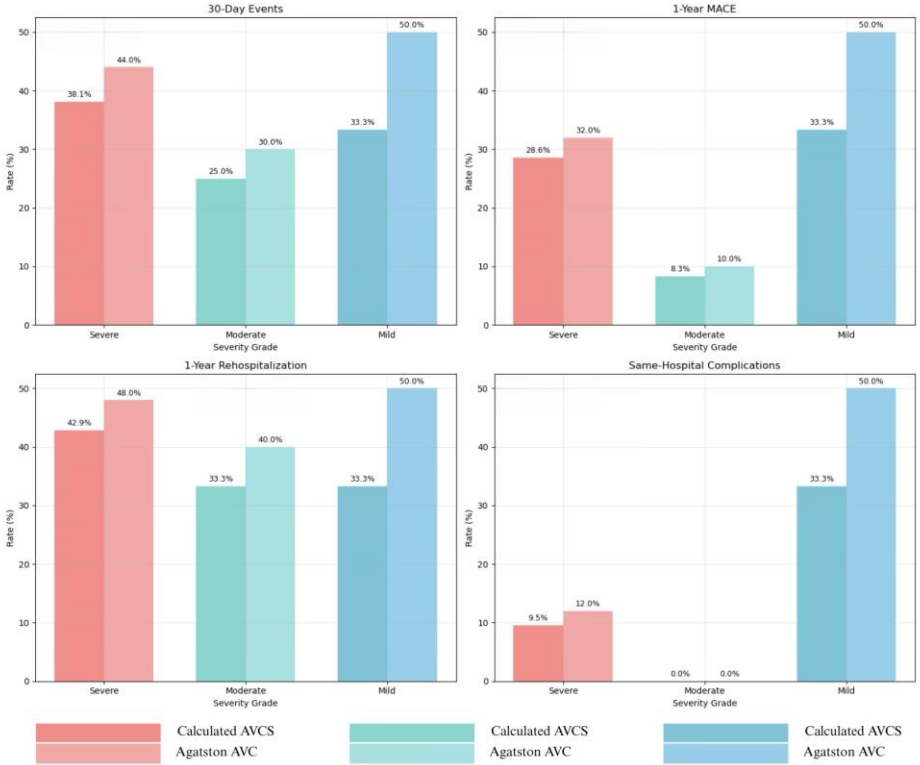
AVC Grading Criteria

Severity	Women	Men
Mild	< 400	< 1000
Moderate	400 – 1299	1000 – 1999
Severe	≥ 1300	≥ 2000





Comparison of outcome based on aortic valve severity grade between calculated AVCS group and Agatston AVC group



No significant difference by method in 30-day mortality (p=0.89) or 1-yr MACE (p=0.916) across severity classes.

Implications

- ce-CT LAT method produce **Agatston-equivalent AVCS** with strong agreement.
- **Prognostic parity** at 30 days and 1 year with nc-CT across severity classes.
- Limits: single center, acquisition heterogeneity → **needs external validation**.

Conclusions

- BAV calcium score can be reliably and accurately calculated from Ce-CT with proposed novel method.
- There is no statistical difference in predicting BAV TAVR outcome between the Agatston method and the proposed novel method.