Aortic Valve Area Reduction

A Novel Concept to Quantify Aortic Stenosis Severity

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Nature of Financial Relationship	Ineligible Company
Grant/Research Support	ANTERIS technologies
Consultant Fees/Honoraria	ANTERIS, Medtronic, Edwards,

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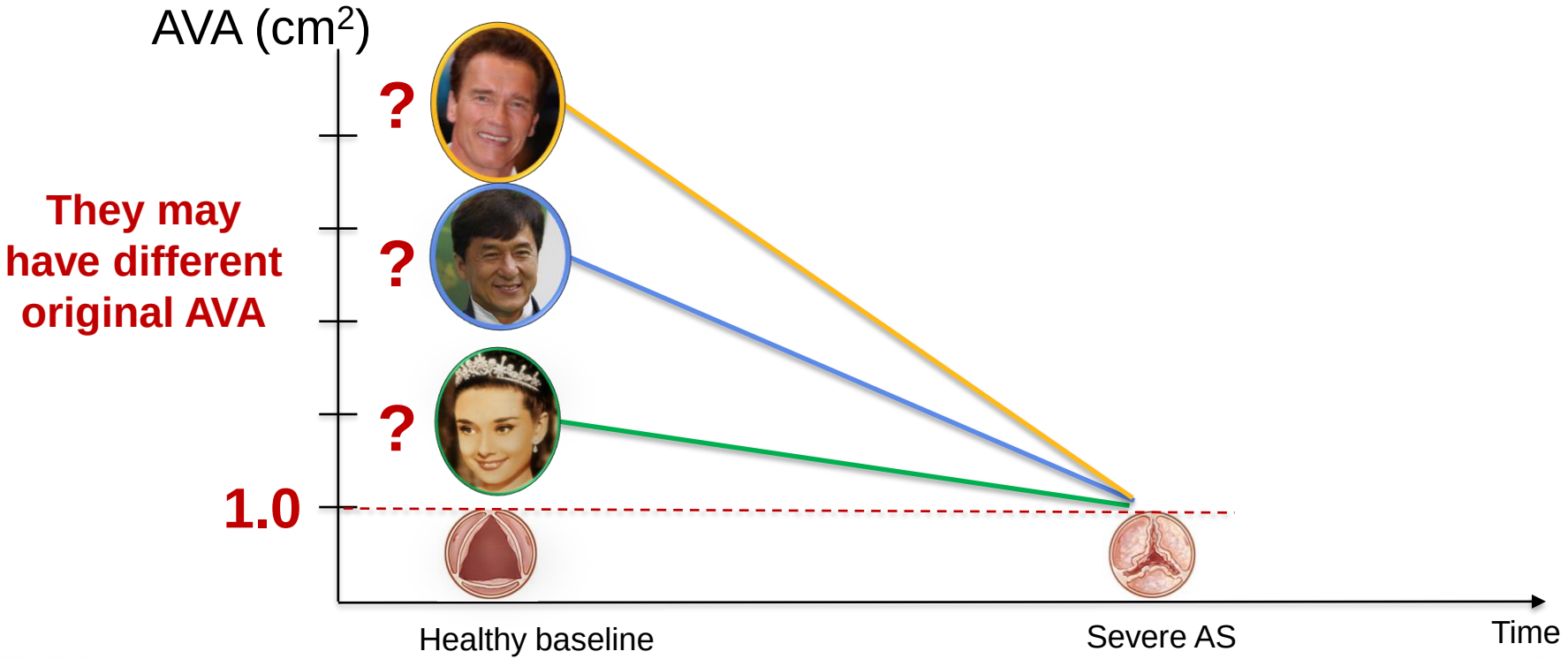
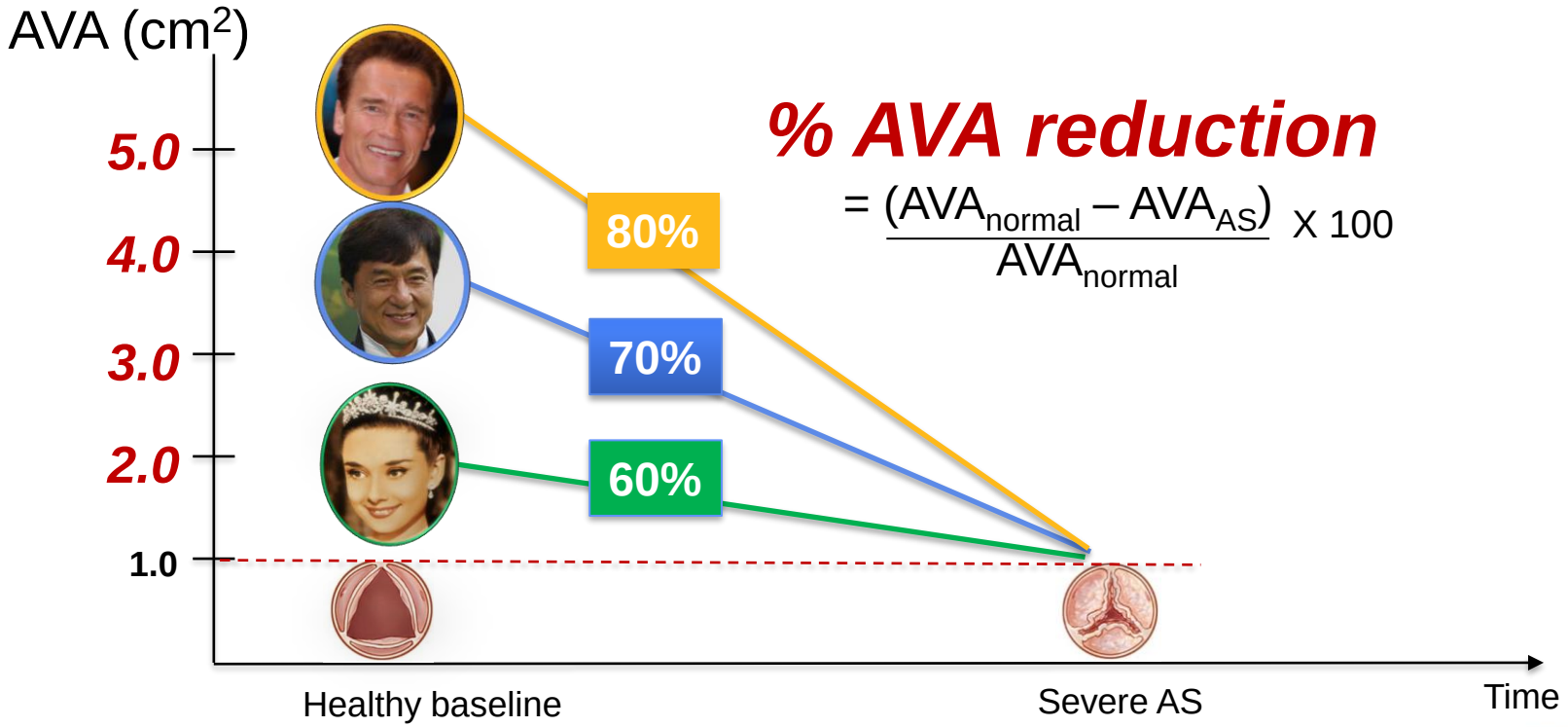
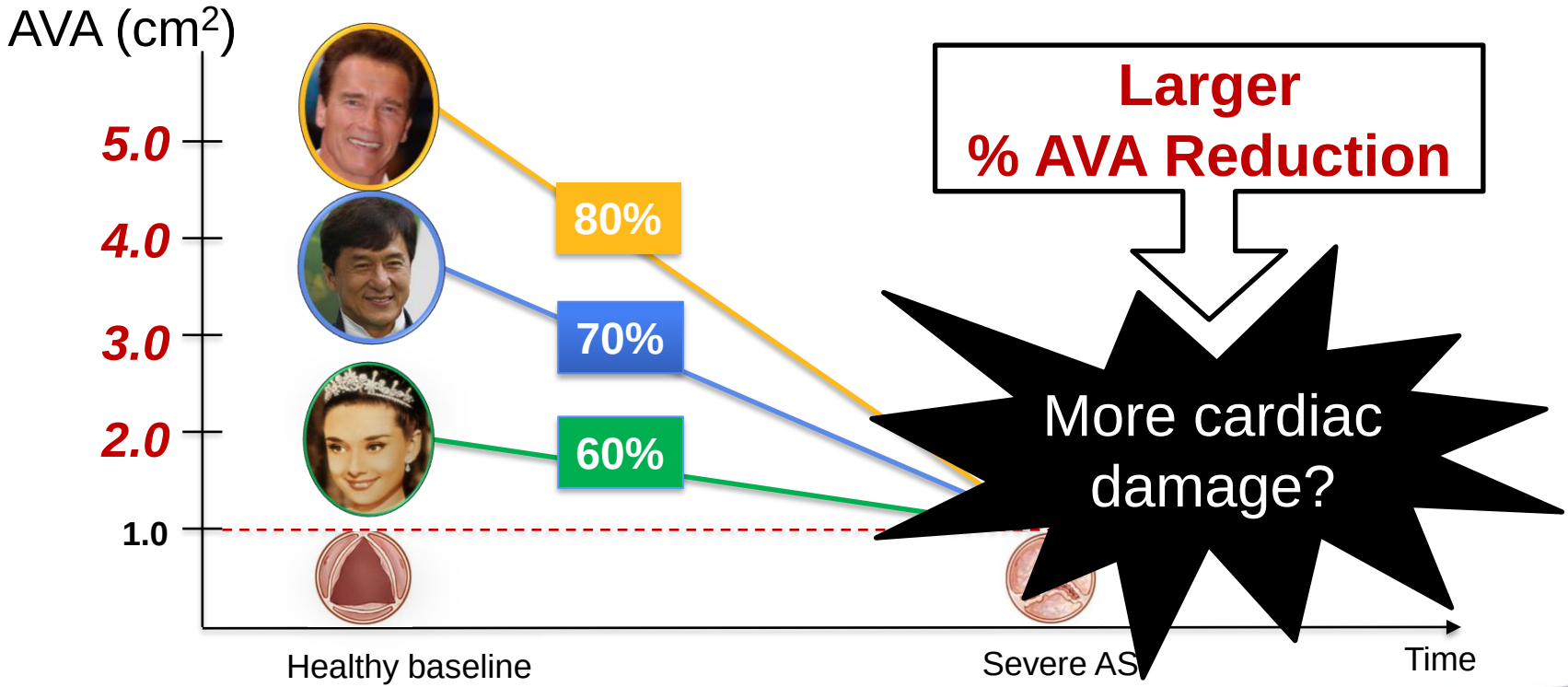
Is AVA < 1cm^2 Cutoff Appropriate for Everyone?



What If We Knew the Original Healthy AVA?

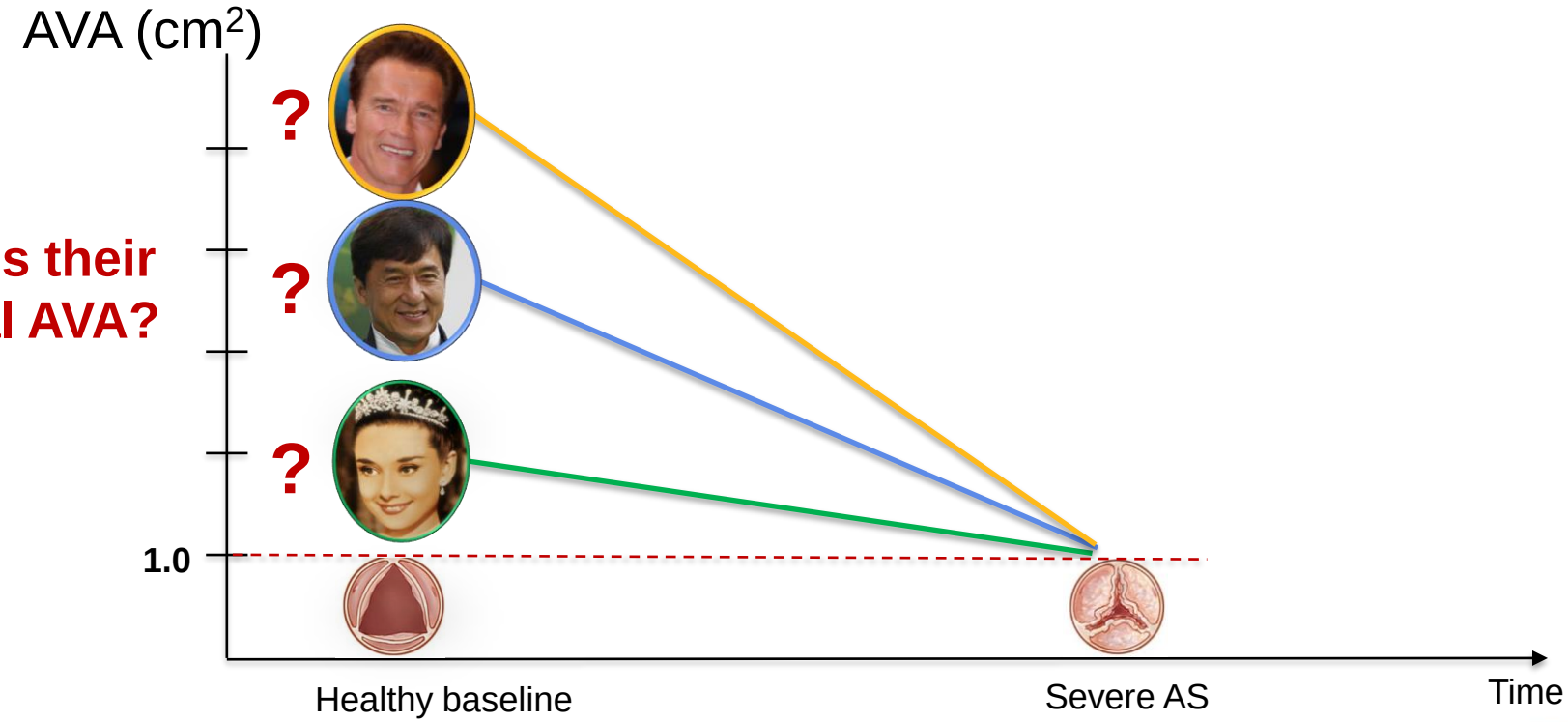


Treating Some Patients Too Late?



What Is the Original Healthy AVA?

What is their normal AVA?



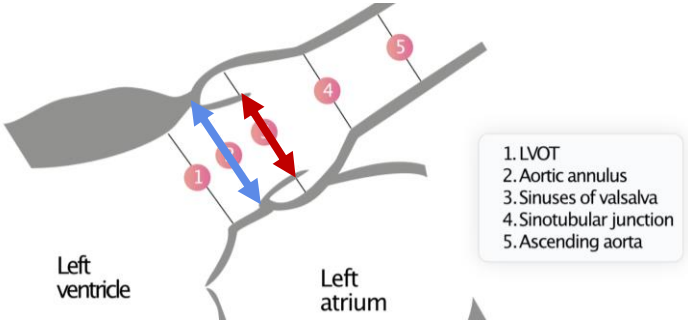
Study aims

1. Estimate the normal AVA
2. Calculate personalized % AVA reduction
3. Study if the % AVA reduction is meaningful

Study design

Part 1: Develop a formula for estimating normal AVA

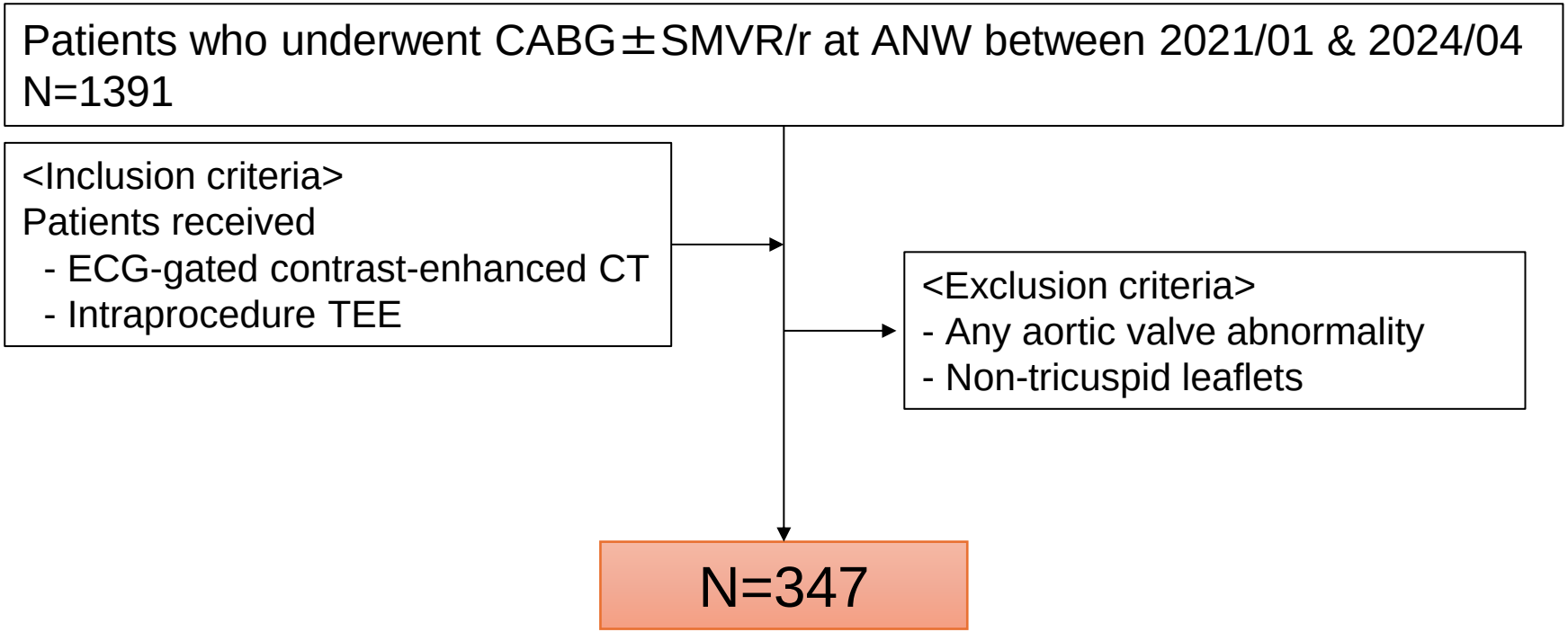
- Cohort: Subjects with normal aortic valve



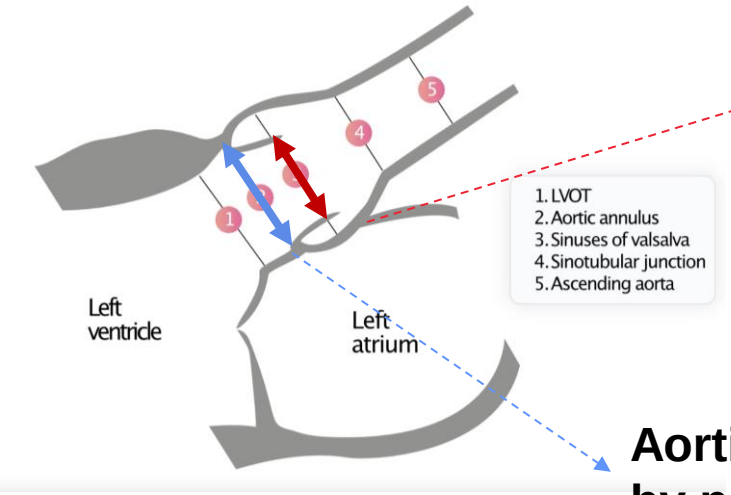
Part 2: Assess distribution of AVA reduction in TAVR cohort

- Cohort: TAVR cohort (Symptomatic Severe AS)

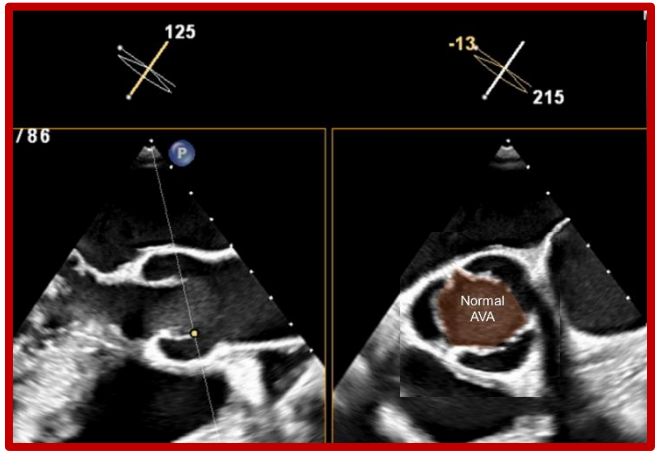
Part 1: Study cohort of normal aortic valve



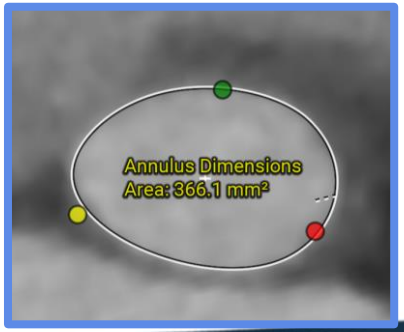
Normal AVA by TEE planimetry, Anulus area by CT



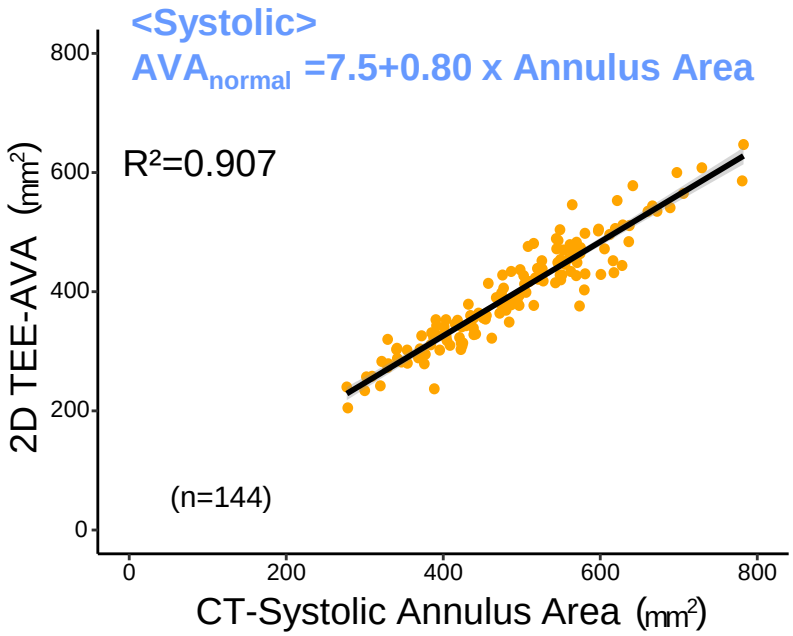
AVA by 2D TEE

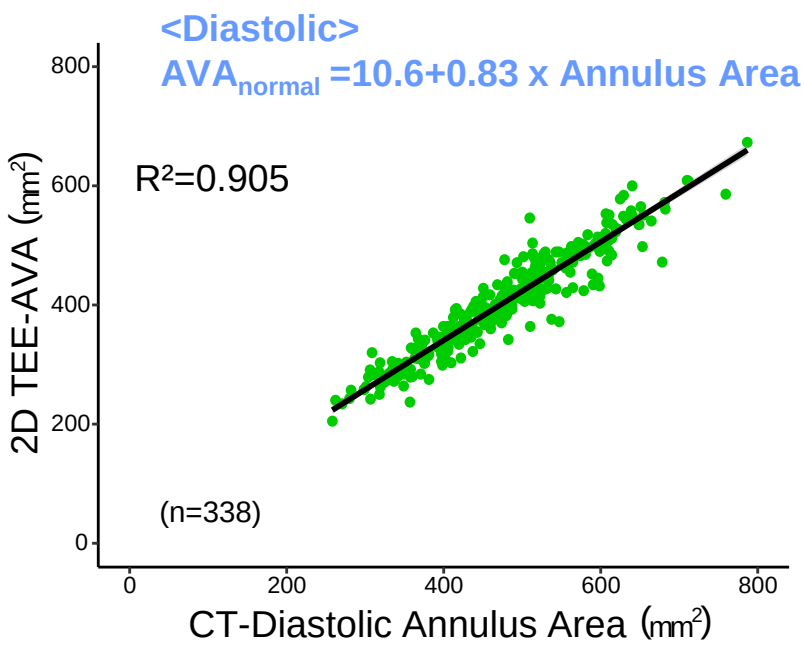


Aortic Annulus Area by pre-surgery CT



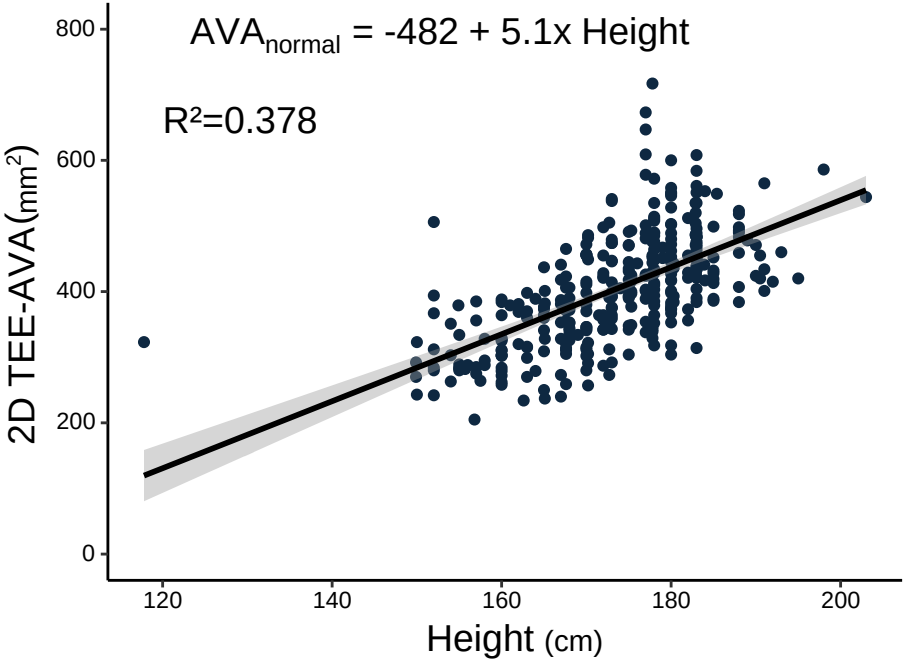
Strong correlation between AVA and Annulus Area

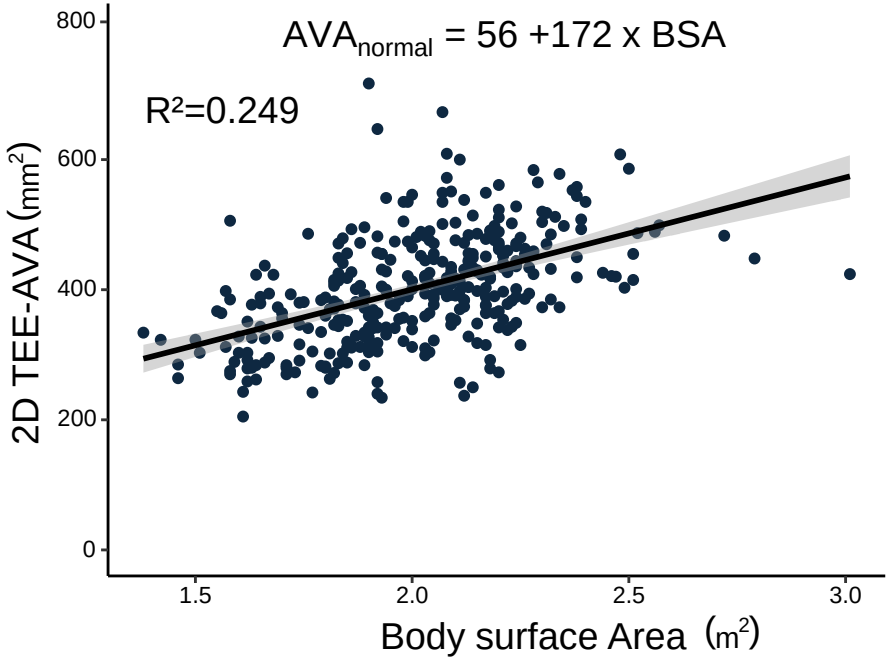




Normal AVA can be estimated by Annulus Area

Height or BSA is not a good reference





Study cohort of TAVR to assess impact of %AVA reduction

TAVR @ Abbott Northwestern Hospital
Jul 2015 – Dec 2021
N=1471

Exclusion
- Bicuspid
- Valve-in-Valve
- Previous aortic valve repair
- No pre-TAVR CT performed

Study population
N=1212

1. $AVA_{normal} = 7.5+0.795 \times AA_{systolic}$

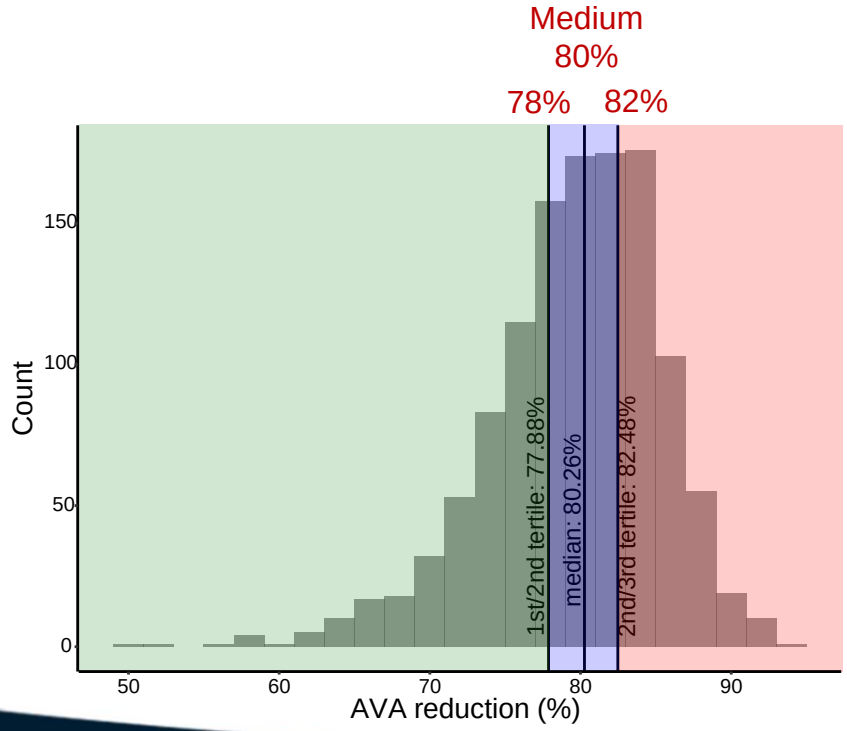
Pre-TAVR CT

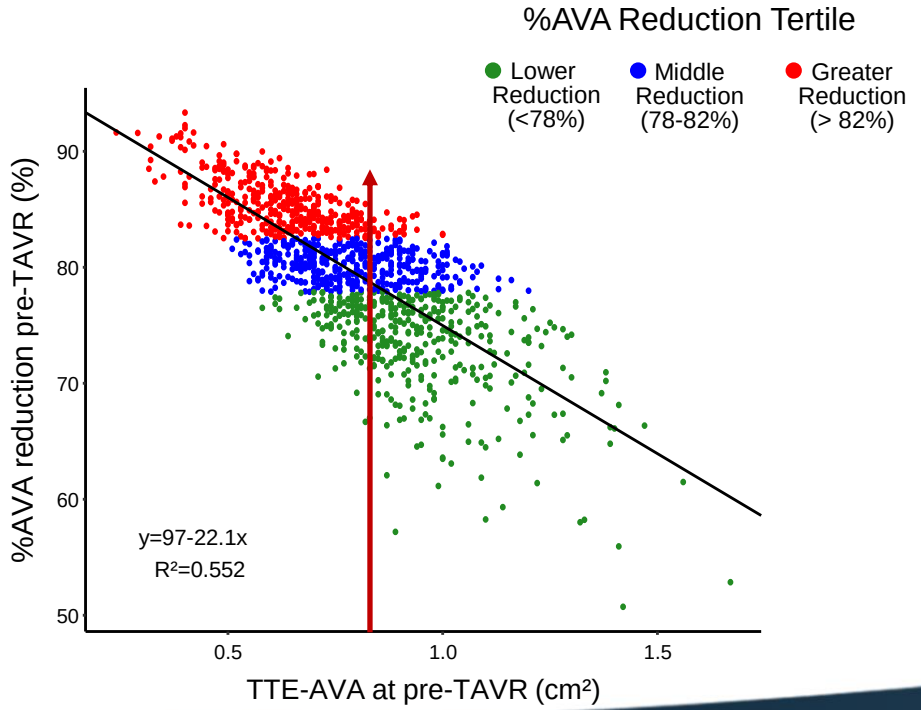
2. AVA reduction (%)

$$= \frac{(AVA_{normal} - AVA_{AS})}{AVA_{normal}} \times 100$$

Pre-TAVR TTE

Wide Variability in %AVA Reduction Compared to Traditional AVA





Patient characteristics

	Overall, N = 1,212	AVA reduction < 77.9% N = 404	AVA reduction 77.9 – 82.5% N = 404	AVA reduction >82.5% N = 404	*p*
Age (years)	82 (76, 87)	**80 (74, 86)**	**83 (77, 87)**	**82 (77, 87)**	**<0.001**
Male, n (%)	705 (58%)	**182 (45%)**	**239 (59%)**	**284 (70%)**	**<0.001**
DM, n (%)	422 (35%)	144 (36%)	140 (35%)	138 (34%)	>0.9
HT, n (%)	1,055 (87%)	354 (88%)	356 (88%)	345 (85%)	0.5
CAD, n (%)	617 (51%)	189 (47%)	207 (51%)	221 (55%)	0.08
Prior MI, n (%)	230 (19%)	70 (17%)	75 (19%)	85 (21%)	0.4
Prior CABG, n (%)	204 (17%)	47 (12%)	75 (19%)	82 (20%)	0.002
Prior PCI, n (%)	409 (34%)	140 (35%)	123 (30%)	146 (36%)	0.2
Afib, n (%)	487 (40%)	**133 (33%)**	**157 (39%)**	**197 (49%)**	**<0.001**
STS-PROM score (%)	3.37 (2.20, 5.30)	3.20 (2.14, 5.14)	3.40 (2.18, 5.03)	3.49 (2.30, 5.68)	0.12
NYHA ≥ III, n (%)	636 (81%)	**199 (80%)**	**191 (76%)**	**246 (86%)**	**0.008**

Greater AVA reduction, More Cardiac Damage

Pre-TAVR TTE	Overall, N = 1,212	AVA reduction < 77.9% N = 404	AVA reduction 77.9 – 82.5% N = 404	AVA reduction >82.5% N = 404	*p*
LVEF (%)	60 (53, 65)	63 (58, 68)	60 (55, 65)	58 (45, 63)	<0.001
LV mass index (g/m²)	113 (94, 136)	105 (88, 127)	117 (96, 140)	122 (101, 144)	<0.001
E/e'	16 (12, 21)	16 (12, 21)	16 (12, 21)	15 (11, 20)	0.035
LAV index (ml/m²)	41 (32, 53)	38 (29, 49)	41 (33, 53)	46 (35, 60)	<0.001
MR ≥ moderate, n (%)	199 (16%)	50 (12%)	64 (16%)	85 (21%)	0.004
TR ≥ moderate, n (%)	173 (14%)	40 (9.9%)	54 (13%)	79 (20%)	<0.001
PASP (mmHg)	37 (29, 48)	35 (28, 45)	36 (29, 47)	39 (31, 51)	<0.001
TAPSE, cm	2.00 (1.70, 2.40)	2.10 (1.80, 2.40)	2.00 (1.70, 2.40)	1.90 (1.50, 2.21)	<0.001
SVi (ml/m²)	37 (30, 44)	44 (37, 51)	38 (33, 43)	31 (25, 36)	<0.001
Cardiac damage* Stage 3 or 4	388 (32%)	103 (25%)	114 (28%)	171 (42%)	<0.001

*Généreux P, et al. Eur Heart J. 2017

Next steps

- Evaluate the incremental value of %AVA reduction beyond conventional TTE parameters for AS severity

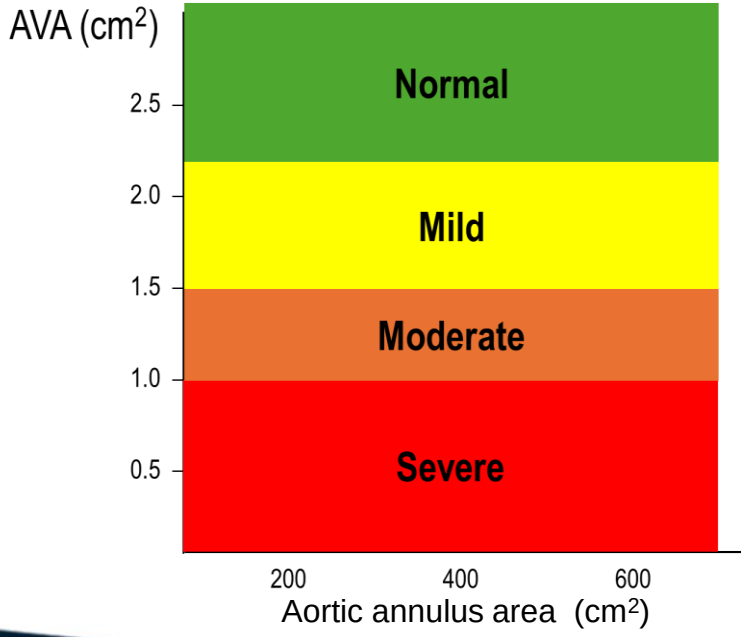
  → *will be presented at London Valves*

- Validate the applicability of %AVA reduction using TTE-measured LVOT or annulus diameter instead of CT-derived annulus area

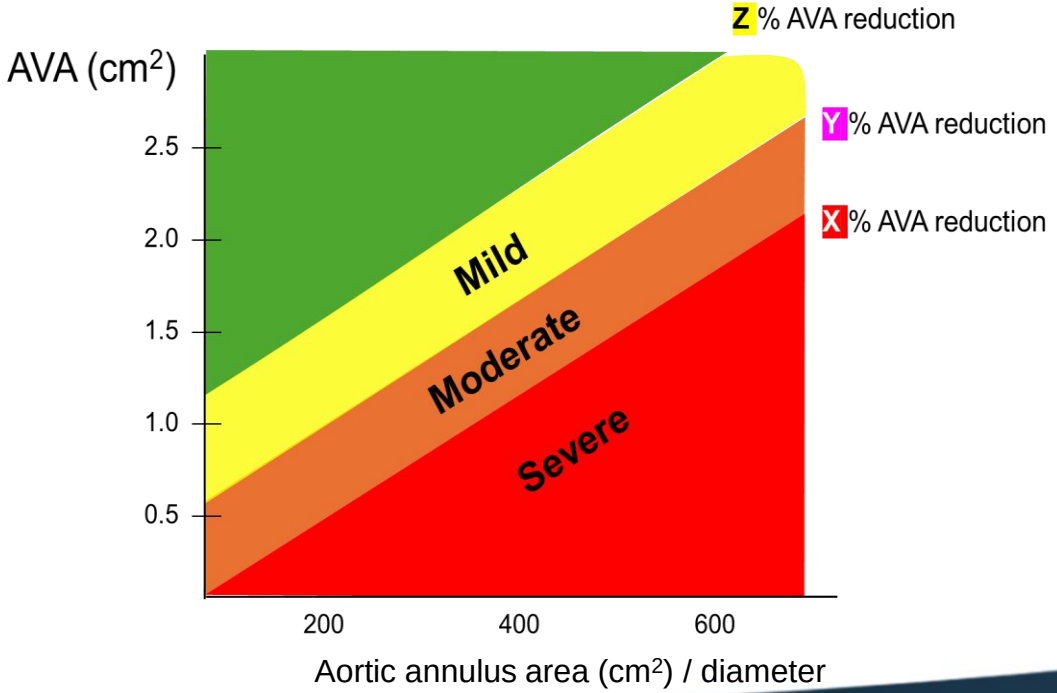
- Determine the optimal cut-off value of %AVA reduction across the entire AS severity spectrum, with focus on moderate and severe AS

Fukui-Sarano-Bapat Definition

Current definition



New definition by AVA reduction



Conclusion

- Developed a formula to estimate normal AVA from annulus area
- %AVA reduction introduced as a novel, personalized metric for AS severity
- This metric improves the quantification of AS severity and risk stratification
- May help optimize timing of aortic valve intervention