

Impact of Transcatheter Aortic Valve Replacement on Acceleration/Ejection Time Ratio and Predictors of Its Pre-Procedural Elevation

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Disclosure of Relevant Financial Relationships

We, Neha Sangani (Author)/ Judah Rajendran (Presenter) DO NOT have any financial relationships to disclose.

Background

- Aortic valve acceleration/ejection time ratio (AV AT/ET) ≥ 0.35 is associated with severe aortic stenosis (AS).
- In Transcatheter Aortic Valve Replacement (TAVR) patients, the associations of elevated AT/ET with other echocardiographic variables and the procedure's impact on this ratio remain unclear.

Objectives

- To evaluate the impact of transcatheter aortic valve replacement (TAVR) on AV AT/ET ratio.
- To identify predictors of pre-procedural AV AT/ET elevation.

Methods

- Retrospective cohort of 1,607 patients undergoing TAVR at Cleveland Clinic (2016–2020).
- Patients categorized by pre-TAVR AV AT/ET ≥ 0.35 (n=490) or ≤ 0.35 (n=1117).
- T-tests and chi-squared tests to assess baseline characteristics; paired t-test to assess impact of TAVR on AT/ET; linear regression to assess predictive value of AT/ET

Baseline Characteristics

Variable	AT/ET>=0.35 n=490	AT/ET<0.35 N=1117	P-value
Age	78±9	79±8	0.24
Female	216(44.1%)	467(41.8%)	0.41
Male	274(55.9%)	650(58.2%)	
BMI	29.5±7	28.8±6	0.1
White race	456(93.1%)	1024(91.7%)	0.63
Black race	17(3.5%)	46(4.1%)	
Other	17(3.5%)	47(4.2%)	
Medical History			
Heart failure	304(72%)	118(28%)	0.08
Pacemaker or ICD	84(17.1%)	131(11.7%)	0.004
Pacemaker	78(15.9%)	121(10.8%)	0.005
ICD	22(4.5%)	32(2.8%)	0.09
MV surgery	12(2.4%)	21(1.9%)	0.45
CAD	254(51.8%)	592(53%)	0.7
PCI	131(26.7%)	349(31.2%)	0.08
CABG	125(25.5%)	306(27.4%)	0.46
Known left main disease	46(9.4%)	111(9.9%)	0.78

Baseline Characteristics

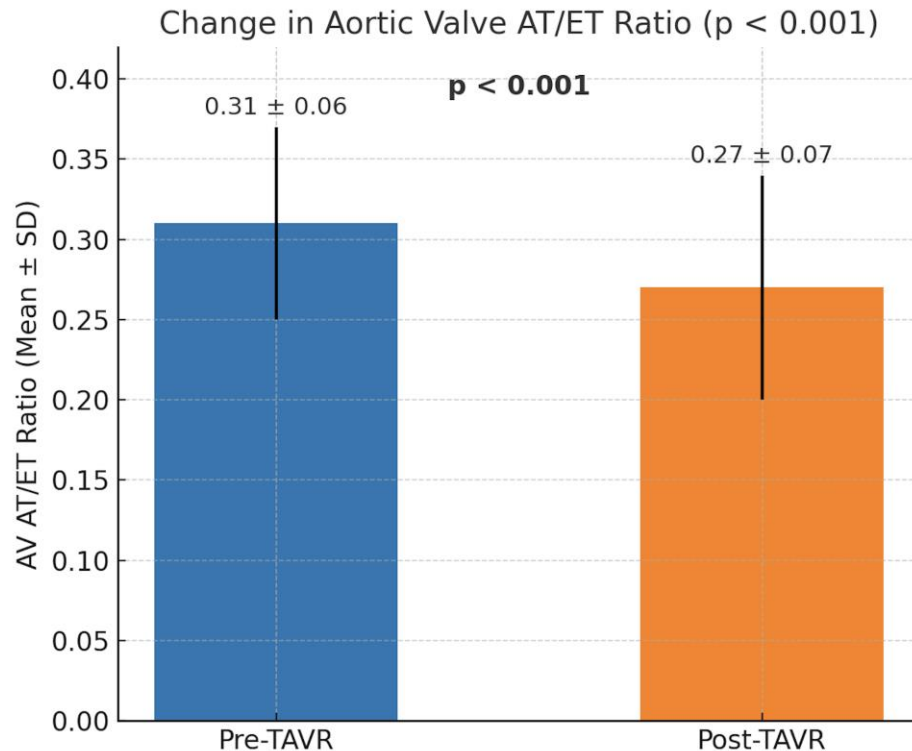
Variable	AT/ET \geq 0.35 n=490	AT/ET<0.35 N=1117	P-value
Myocardial infarction	107(21.8%)	248(22.2%)	0.89
Stroke	60(12.2%)	131(11.7%)	0.8
Transient ischemic attack	52(10.6%)	113(10.1%)	0.78
Carotid disease	99(20.2%)	289(25.9%)	0.01
PAD	324(66.1%)	726(65%)	0.69
Diabetes	183(37.3%)	421(37.7%)	0.91
Current/Recent Smoker	23(4.7%)	49(4.4%)	0.79
Current dialysis	18(3.7%)	38(3.4%)	0.76
Chronic lung disease	214(43.7%)	470(42.1%)	0.58
Atrial fibrillation or flutter	212(43.3%)	465(41.6%)	0.54
Native bicuspid aortic valve	36(7.3%)	62(5.6%)	0.17
Severe AS	306(78.9%)	82(21.1%)	0.002
STS risk score	6.1 \pm 4	5.9 \pm 4	0.32

Echocardiographic Variables

Variable	AT/ET \geq 0.35	AT/ET $<$ 0.35	P-value
Blood Pressure	132 \pm 22	139 \pm 24	<0.001
LVEF	52.8 \pm 14	57.3 \pm 11	<0.001
AV Mean Gradient	41.9 \pm 16	40.1 \pm 14	0.12
AV Peak Gradient	3.2 \pm 1.5	3.6 \pm 1	0.38
AV VTI	0.96 \pm 0.2	0.97 \pm 0.2	0.96
LVOT VTI	0.2 \pm 0.05	0.2 \pm 0.05	<0.001
AV area	0.7 \pm 0.1	0.76 \pm 0.2	<0.001
LA Volume	89.4 \pm 33	84.3 \pm 32	0.03
LA diameter	4.4 \pm 0.7	4.3 \pm 0.8	0.18
LVMI	113 \pm 34	106 \pm 31	0.002
LV end-diastolic volume	107 \pm 50	101 \pm 39	0.12
LV end-systolic volume	52 \pm 41	45 \pm 28	0.01
LVOT diameter	2 \pm 0.1	2 \pm 0.1	0.96
LVOT maximum velocity	0.8 \pm 0.2	0.9 \pm 0.1	<0.001
LVOT stroke volume	67 \pm 19	72 \pm 18	<0.001
SVI	34 \pm 10	37 \pm 9	<0.001
LVMI	113.8 \pm 34	106.1 \pm 31	0.002

Results – Impact of TAVR

- Mean AV AT/ET decreased significantly within 3 months following TAVR:
 - From 0.31 to 0.27 ($p < 0.001$)

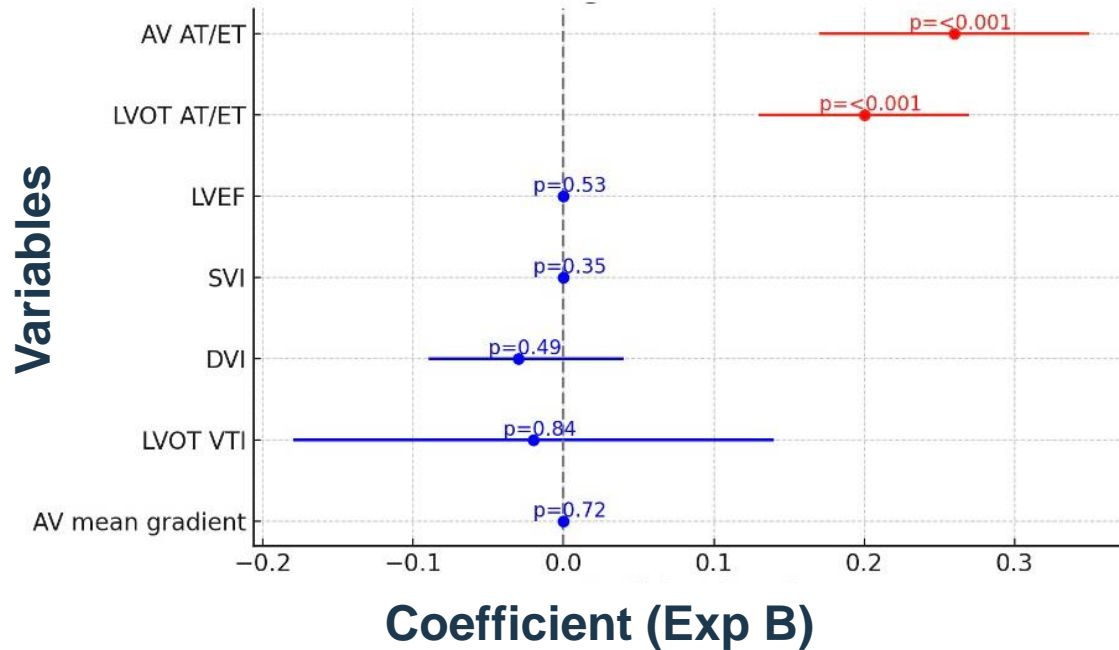


Results – Predictive Value

- Proportional reduction: higher pre-TAVR AV AT/ET predicted higher post-TAVR ($p < 0.001$).
- No correlation with post-TAVR AV mean gradient ($p = 0.72$).

Results – Predictive Value cont.

Prediction of Post-TAVR Echocardiographic Variables from Baseline AT/ET



Clinical Implications

- Pre-TAVR AV AT/ET can be useful to identify patients who may be at a high-risk of having higher AT/ET ratio post TAVR.
- Since post TAVR AT/ET ratio predict clinical outcomes, future studies are needed to identify possible procedural modifications that may help to mitigate higher post procedural AT/ET ratio.
- Integration of AT/ET ratio into pre and post procedural risk stratification algorithms may be helpful for better characterization of hemodynamics for AS patients before and after AVR.

Limitations

- Single center retrospective analysis
- Multivariable analysis to understand independent determinants of pre TAVR AT/ET ratio needs to be completed (on going research)
- Clinical implications and determinants of persistently higher AT/ET ratio after TAVR compared to pre TAVR AT/ET ratio is also not presented in this analysis but is being actively investigated

Conclusions

- Elevated pre-TAVR AV AT/ET associated with smaller AVA, lower BP, lower LVEF and predicts higher post-TAVR AV and LVOT AT/ET
- TAVR significantly reduces AV AT/ET ratio.
- Post TAVR AT /ET ratio correlates with post TAVR At/ET ratio