

Recovery of Left Ventricular Mechanics Following Transcatheter Aortic Valve Implantation: Long-term Follow-up in Patients with Four Subtypes of Aortic Stenosis

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INTRODUCTION

- Left ventricular mechanics are impaired in patients with severe aortic stenosis (AS).
- Global longitudinal strain (GLS) may recover differentially after relief of AS and may help identify select patients who have a higher likelihood of survival post transcatheter aortic valve implantation (TAVI)

HYPOTHESIS

- We hypothesized there would be differences in myocardial mechanics (measured by GLS) following TAVI in patients with four subtypes of severe AS, and these differences could predict survival.

METHODS

- All patients undergoing TAVI from January 2011 – March 2016 who had pre and post TAVI GLS data available.
- Speckle-tracking transthoracic echocardiography using GE Vivid E9 and E95 platforms.
- Classified by peak velocity, mean aortic gradient, LVEF and stroke volume index as:
 - (1) Normal flow and high gradient
 - (2) Normal flow and gradient with low EF
 - (3) "Classic" low flow and low gradient (LFLGAS)
 - (4) Paradoxical low flow and low gradient.

Table 1 Characteristics	Type AS					P-value
	Overall (n=208)	1 (n=108)	2 (n=29)	3 (n=31)	4 (n=40)	
Demographics						
Age	81.8 ± 10.1	81.4 ± 11.2	81.9 ± 10.2	83.1 ± 5.3	80.7 ± 9.7	0.800
Female	113 (54.3%)	65 (60.2%)	17 (58.6%)	8 (25.8%)	23 (57.5%)	0.007
STS Score	7.7 ± 5.0	8.5 ± 6.1	8.0 ± 3.7	7.6 ± 3.9	6.3 ± 3.2	0.129
Comorbidities						
Coronary Artery Disease	159(76.4%)	81(75.0%)	23(79.3%)	24(77.4%)	31(77.5%)	0.962
Diabetes Mellitus	79(38.0%)	38(35.2%)	12(41.4%)	9(29.0%)	20(50.0%)	0.266
Hypertension	175(84.1%)	89(82.4%)	22(75.9%)	27(87.1%)	37(92.5%)	0.258
Peripheral Artery Disease	104(50.0%)	58(53.7%)	12(41.4%)	14(45.2%)	20(50.0%)	0.642
Cerebrovascular Accident	19(9.1%)	14(13.0%)	4(13.8%)	1(3.2%)	-	-
TAVR						
Valve Type						
EVOLUT	47(22.6%)	22(20.4%)	3(10.3%)	6(19.4%)	16(40.0%)	
SAPIEN	19(9.1%)	14(13.0%)	3(10.3%)	-	2(5.0%)	
COREVALVE	142(68.3%)	72(66.7%)	23(79.3%)	25(80.6%)	22(55.0%)	
Access for TAVR						
Transfemoral	176(84.6%)	90(83.3%)	24(82.8%)	27(87.1%)	35(87.5%)	
Transapical	11(5.3%)	8(7.4%)	1(3.4%)	-	2(5.0%)	
Direct aortic	20(9.6%)	9(8.3%)	4(13.8%)	4(12.9%)	3(7.5%)	

Table 2 Type of AS	Pre-TAVI		Post-TAVI		Alive (%)	Deceased (%)
	LVEF (%)	GLS	LVEF (%)	GLS		
1 (n=108)	62.5±9.6	-15.3±3.3	64.7±8.1	-16.2±3.7	88 (81)	20 (19)
2 (n=29)	37.9±9.7	-10.6±3.2	44.8±11.8	-12.3±3.7	24 (83)	5 (17)
3 (n=31)	37.3±10.1	-10.1±3.0	38.3±13.3	-10.8±3.4	20 (65)	11 (35)
4 (n=40)	61.1±8.7	-16.6±3.6	63.0±8.5	-17.1±4	31 (78)	9 (22)

Figure 1 – Change in GLS Normal Flow, High Gradient Severe AS

Pre-TAVI GLS -16.8%



Post-TAVI GLS - 18.0%

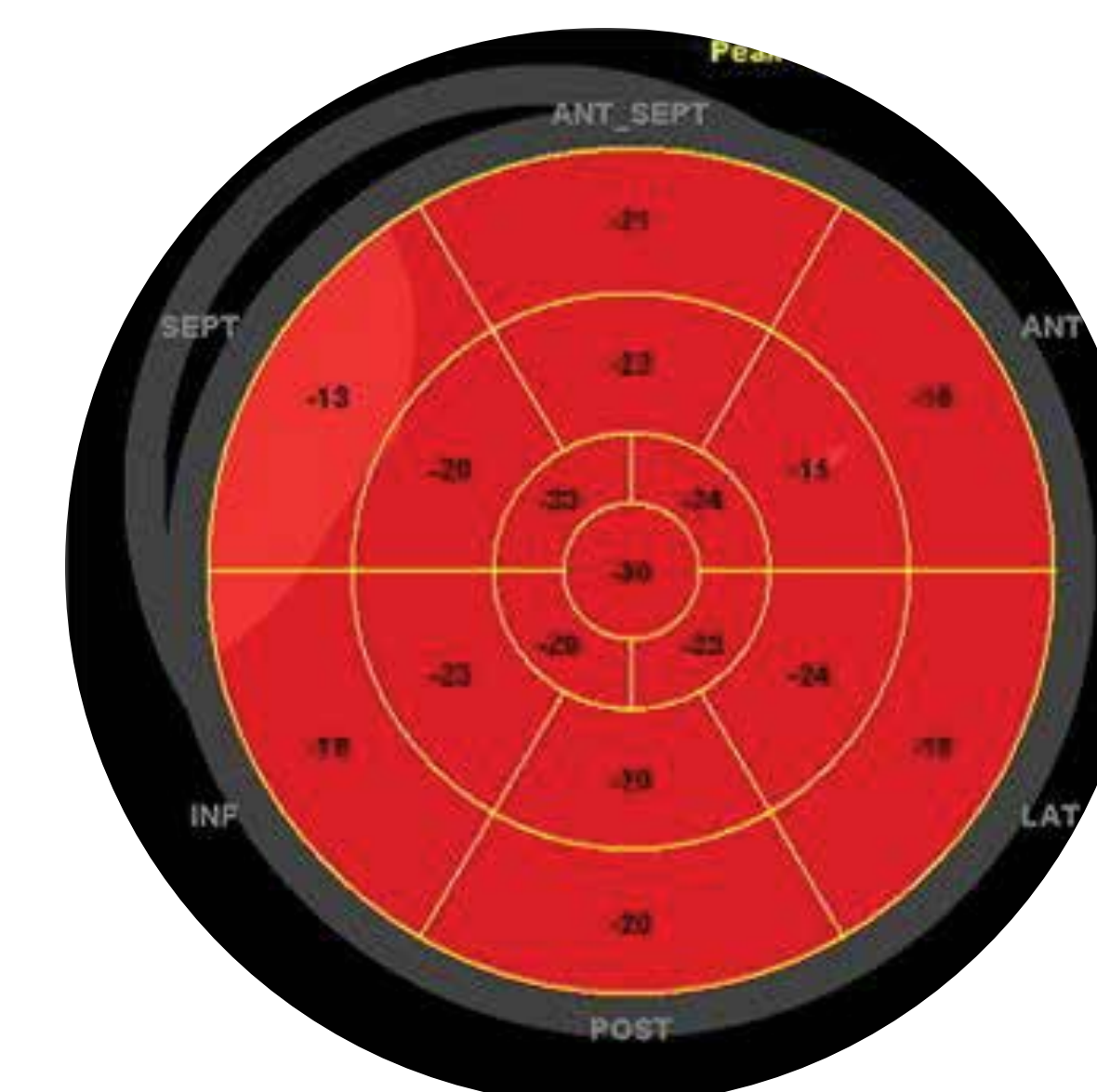
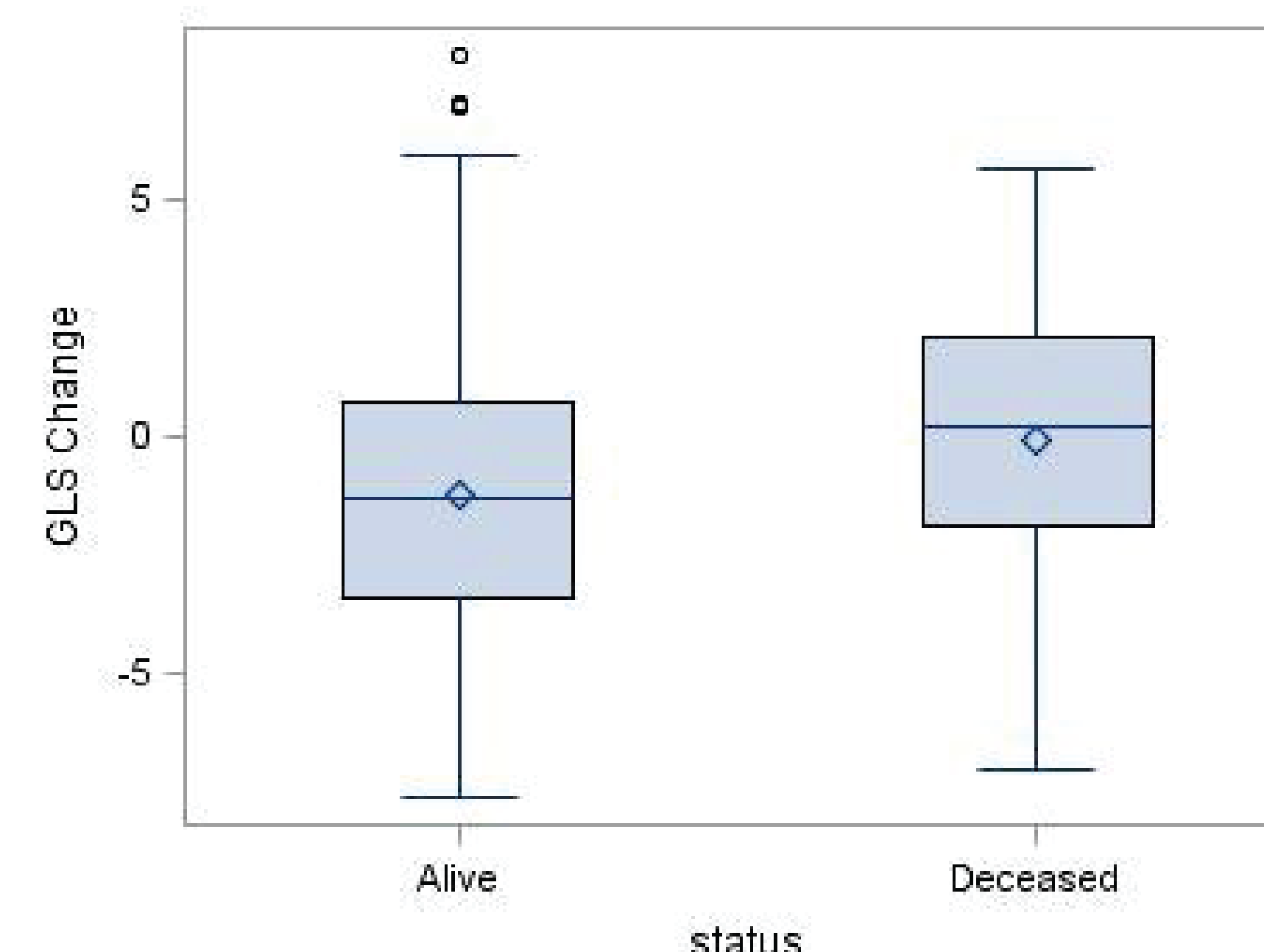


Figure 2 - GLS Recovery from pre-to-post TAVI and Survival



RESULTS

- Two hundred-eight patients with severe AS who underwent TAVI were analyzed (Table 1); 45 died during the 5 year study period
- No significant differences were noted in age or comorbidities. "Classic" low flow low gradient stenosis patients were more likely men
- GLS measured pre-TAVI and 0-30 days post TAVI (99% of patients, 2 patients with 30-90 day GLS assessment). (Table 2)
- Both GLS (-14.0 ± 4 to -15.0 ± 4.3 , $p < .0001$) and LVEF ($56 \pm 14\%$ to $58 \pm 15\%$, $p = 0.0003$) improved significantly post TAVI.
- Across all types of AS, improvement in GLS associated with a survival benefit, with GLS recovery in alive patients (mean GLS pre-TAVI -14.2 ± 4.1 and post-TAVI -15.2 ± 4.1 , $p < .001$) and no significant recovery in deceased patients (mean GLS pre-TAVI -14.1 ± 4.2 and post-TAVI -14.2 ± 4.4 , $p = 0.8858$) (Figure 2)
- Patients with "classic" LFLGAS showed no significant improvement post TAVI in GLS or LVEF, and had highest overall mortality rate.

CONCLUSIONS

- LVEF and GLS improved significantly post-TAVI
- "Classic" low flow, low gradient AS patients had lowest post-procedure GLS recovery and highest overall mortality in study period
- Across all types of AS, GLS recovery was noted in patients who survived, but not in patients who subsequently died.