

Predictors of Conduction Recovery in patients with High-Degree Atrioventricular Block after Self expandable Transcatheter Aortic Valve Replacement

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Background

High-degree atrioventricular (HD-AVB) block is frequently seen post transcatheter aortic valve replacement (TAVR) with right ventricular pacing induced cardiomyopathy being a potential long-term complication.

Methods

A retrospective review of 58 patients (32 women, 27 men) who underwent permanent pacemaker implantation for HD-AVB within a 7-day period post TAVR with self-expanding valves was performed. Serial pacemaker interrogations up to 1-year post TAVR were reviewed to assess for recovery of atrioventricular (AV) conduction defined as ventricular pacing percentage of < 3%. Baseline, procedural and post procedural characteristics (Table. 1) were analyzed to identify predictors of AV conduction recovery.

Table 1. Baseline, procedural and post procedural characteristics

	No Recovery n(n%)	Recovery n(n%)	p-value
Age at procedure, mean (SD)	83.3 (4.8)	83.18 (5)	0.26
Race			
American Indian or Alaska Native	1 (1%)	0 (0%)	
White	1 (1%)	1 (0%)	
Black/African American	18 (31%)	17 (34%)	0.67
Ethnicity			
Not Hispanic	40 (70%)	36 (76%)	
Hispanic	0 (0%)	2 (11%)	0.032
Gender			
Female	22 (39%)	18 (37%)	
Male	18 (31%)	0 (0%)	0.97
Smoking status			
No	18 (31%)	18 (37%)	
Yes	2 (5%)	0 (0%)	0.33
Alcohol use			
No	24 (41%)	22 (46%)	
Yes	16 (28%)	6 (12%)	0.74
Recreational drug use			
No	23 (39%)	18 (37%)	
Yes	16 (28%)	6 (12%)	0.49
BMI (kg/m ²), mean (SD)	28.5 (7.4)	28.4 (8.5)	0.96
Hx of heart failure	13 (23%)	5 (10%)	0.72
NYHA class			
I	1 (1%)	0 (0%)	
II	17 (30%)	5 (10%)	0.67
III	19 (33%)	12 (25%)	
IV	1 (1%)	1 (0%)	0.32
NYHA III/IV	21 (36%)	13 (27%)	0.21
Hx of atrial fibrillation	11 (19%)	3 (6%)	0.67
Hx of atrial fibrillation/flutter	22 (39%)	5 (10%)	0.56
Hx of COPD	9 (16%)	5 (10%)	0.66
Hx of PVD	7 (12%)	2 (11%)	0.53
Hx of CAD	7 (12%)	7 (14%)	0.88
Hx of Myocardial infarction	6 (10%)	4 (8%)	0.50
Hx of hypertension	39 (67%)	18 (37%)	0.50
Hx Diabetes	19 (33%)	7 (14%)	0.54
Hx of CAD known prior to TAVR eval	17 (30%)	11 (23%)	0.39
Hx of dyslipidemia	33 (57%)	14 (29%)	0.67
Hx of pulmonary hypertension	9 (16%)	1 (2%)	0.21
Hx of symptomatic bradycardia	9 (16%)	5 (10%)	0.66
Hx of peripheral vascular disease	8 (14%)	4 (8%)	0.81
Hx of renal disease	19 (33%)	13 (27%)	0.58
uGFR <30	18 (31%)	8 (16%)	0.97
uGFR <30	1 (1%)	4 (8%)	0.01
ACE admit	9 (16%)	3 (6%)	0.61
ARB admit	4 (7%)	5 (10%)	0.58
Beta Blockers admit	19 (33%)	14 (29%)	0.03
Calcium channel blockers admit	12 (21%)	6 (12%)	0.30
Hydrochloride admit	0 (0%)	1 (2%)	0.33
Nitrate admit	4 (7%)	3 (6%)	0.47
Potassium sparing diuretics admit	3 (5%)	1 (2%)	0.79
Statins admit	32 (55%)	13 (27%)	0.31
ACE diach	4 (7%)	2 (4%)	0.67
ARB diach	3 (5%)	5 (10%)	0.64
Beta Blockers diach	22 (38%)	12 (25%)	0.40
Calcium channel blockers diach	15 (26%)	6 (12%)	0.76
Hydrochloride diach	0 (0%)	2 (4%)	0.63
Nitrate diach	4 (7%)	3 (6%)	0.47
Potassium sparing diuretics diach	3 (5%)	1 (2%)	0.61
Statins diach	31 (53%)	14 (29%)	0.38
LVEF baseline, mean (SD)	58.3 (11.3)	57.8 (10.9)	0.88
Valve size, mean (SD)	29 (2.7)	29.2 (2.5)	0.85
Valve depth, mean (SD)	5.9 (1.9)	5.5 (1.9)	0.87
PR interval post, mean (SD)	232.4 (54.9)	198.3 (51.2)	0.13
Baseline QRS axis, mean (SD)	27.4 (74.9)	22.9 (45.0)	0.81
QRS post, mean (SD)	138.4 (22.3)	133.3 (25.1)	0.40
Baseline left axis deviation, mean (SD)	-11 (28%)	5 (7%)	0.17
Baseline left anterior fascicular block	5 (13%)	0 (0%)	0.32
New LAFB post	1 (1%)	0 (0%)	0.50
Baseline left posterior fascicular block (N)	40 (100%)	18 (100%)	
New LPFB post (N)	40 (100%)	18 (100%)	
Baseline incomplete RBBB	1 (1%)	1 (0%)	0.56
New incomplete RBBB post (N)	40 (100%)	18 (100%)	
Baseline VCD	1 (1%)	1 (0%)	0.56
New VCD post	1 (1%)	0 (0%)	0.33
Baseline Mobitz I	1 (1%)	0 (0%)	0.50
New Mobitz I post (N)	40 (100%)	18 (100%)	
Baseline Mobitz II (N)	40 (100%)	18 (100%)	
New Mobitz II post (N)	40 (100%)	18 (100%)	
CHB on post TAVR EKG	18 (31%)	3 (7%)	0.04

	Odds Ratio	Std. Err.	Lower 95% CI	Upper 95% CI	p-value
Beta blockers on admission	5.96	5.29	1.04	33.9437	0.04
RBBB pre TAVR	0.16	0.16	0.02	1.06	0.06
Valve Depth	1.39	0.34	0.85	2.25	0.19
Age	0.91	0.06	0.80	1.04	0.16
Male gender	0.94	0.69	0.23	3.95	0.94
Hx of atrial fibrillation or flutter	0.29	0.22	0.06	1.33	0.11
Calcium channel blockers on admission	0.84	0.69	0.17	4.23	0.83
CHB on post TAVR EKG	0.18	0.14	0.04	0.87	0.03

Table 2. Multivariate logistic regression: Recovery post TAVR as outcome

Results

AV conduction recovery within 1 year was observed in 18 (31%) patients. Univariate analysis showed betablocker use prior to TAVR and angiotensin receptor blocker use at discharge post TAVR to be associated with a higher likelihood of AV conduction recovery while complete heart block (CHB) noted on the immediate post TAVR EKG was associated with lack of conduction recovery.

On logistic regression multivariate analysis, betablocker use prior to TAVR (OR 5.96, 95% CI 1.04 -33.9, p = 0.04) was associated with a higher likelihood of AV conduction recovery and CHB on the immediate post TAVR EKG (OR 0.18, 95% CI 0.07 – 0.03, p value 0.03) was associated with an 82% higher risk of not recovering. PR interval, QRS duration, baseline first degree AV block, right bundle branch block, development of left bundle branch block post procedure, depth of valve implantation and valve oversizing were not significantly associated with AV conduction recovery.

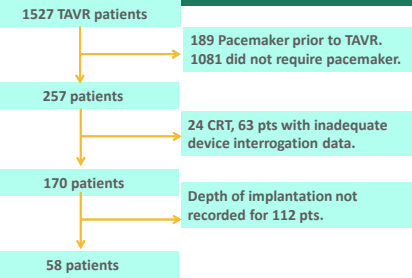
Beta blocker use prior to TAVR is associated with AV Conduction recovery in patients who develop HD-AVB post TAVR.

Conclusion

AV Conduction recovery was demonstrated in 31% of patients who developed HD-AVB post TAVR. Betablocker use prior to TAVR was a predictor and immediate peri-procedural development of CHB was negatively associated with AV conduction recovery.

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	No Recovery n=40	Recovery n=18	p-value
eGFR < 30	1 (3%)	4 (22%)	0.01
Betablockers on admission	19 (48%)	14 (78%)	0.03
ARB on DC	3 (8%)	5 (28%)	0.04
CHB on post TAVR EKG	0 (0%)	2 (11%)	0.03
CHB on immediate post TAVR EKG	18 (45%)	3 (17%)	0.04



	Odds Ratio	Std. Err.	Lower 95% CI	Upper 95% CI	p-value
Beta blockers on admission	5.96	5.29	1.04	33.9437	0.04
RBBB pre TAVR	0.16	0.16	0.02	1.06	0.06
Valve Depth	1.39	0.34	0.85	2.25	0.19
Age	0.91	0.06	0.80	1.04	0.16
Male gender	0.94	0.69	0.23	3.95	0.94
Hx of atrial fibrillation or flutter	0.29	0.22	0.06	1.33	0.11
Calcium channel blockers on admission	0.84	0.69	0.17	4.23	0.83
CHB on post TAVR EKG	0.18	0.14	0.04	0.87	0.03

	No Recovery n=40	Recovery n=18	p-value
Age at procedure, mean (SD)	83.3 (8.8)	81.8 (8.9)	0.26
Age			
American Indian or Alaska Native	1 (3%)	0 (0%)	0.67
Black/African American	1 (3%)	1 (6%)	0.67
Hispanic	18 (45%)	17 (94%)	
White	21 (53%)	1 (6%)	
Unknown	0 (0%)	0 (0%)	
Gender			
Female	22 (55%)	18 (100%)	0.97
Male	18 (45%)	0 (0%)	
Smoking status			
Yes	18 (45%)	18 (100%)	0.33
No	2 (5%)	0 (0%)	
Alcohol use			
Yes	24 (60%)	11 (61%)	0.74
No	16 (40%)	6 (33%)	
Recreational drug use			
Yes	23 (58%)	11 (61%)	0.69
No	16 (40%)	6 (33%)	
CHB pre(TAVR), mean (SD)	28.5 (7.4)	28.4 (8.5)	0.96
% of heart failure	18 (45%)	5 (28%)	0.72
NYHA class			
I	1 (3%)	0 (0%)	
II	17 (43%)	5 (28%)	
III	19 (48%)	12 (67%)	
IV	1 (3%)	1 (6%)	0.52
NYHA at DC	22 (55%)	13 (72%)	0.21
% of aortic fibrosis/flutter	1 (3%)	1 (6%)	0.87
% of COPD	22 (55%)	5 (28%)	0.06
% of CVD	9 (23%)	5 (28%)	0.66
% of PVD	7 (18%)	2 (11%)	0.53
% of CABG	7 (18%)	7 (39%)	0.08
% of Myocardial infarction	6 (15%)	1 (6%)	0.56
% of aortic stenosis	19 (48%)	18 (100%)	0.50
% Diabetes	19 (48%)	7 (39%)	0.54
% of CAD known prior to TAVR eval	17 (43%)	11 (61%)	0.19
% of dyslipidemia	19 (48%)	14 (78%)	0.07
% of primary hypertension	9 (23%)	1 (6%)	0.11
% of angiotensin inhibitors	9 (23%)	5 (28%)	0.66
% of peripheral vascular disease	8 (20%)	4 (22%)	0.85
% of renal disease	19 (48%)	13 (72%)	0.08
ACEi adm	19 (48%)	13 (72%)	0.07
ACEi disch	1 (3%)	4 (22%)	0.02
ACEi adm	9 (23%)	1 (6%)	0.61
ARB adm	4 (10%)	5 (28%)	0.08
Beta Blockers adm	19 (48%)	14 (78%)	0.03
Calcium channel blockers adm	12 (30%)	4 (22%)	0.80
Hydrochloride adm	0 (0%)	1 (6%)	0.13
Hydrozole adm	4 (10%)	3 (17%)	0.47
Potassium sparing diuretics adm	1 (3%)	1 (6%)	0.79
Diuretic adm	12 (30%)	13 (72%)	0.16
ACEi disch	4 (10%)	1 (6%)	0.47
ARB disch	3 (8%)	5 (28%)	0.04
Beta Blockers disch	22 (55%)	12 (67%)	0.40
Calcium channel blockers disch	15 (38%)	6 (33%)	0.76
Hydrochloride disch	0 (0%)	2 (11%)	0.03
Hydrozole disch	4 (10%)	3 (17%)	0.47
Potassium sparing diuretics disch	2 (5%)	1 (6%)	0.93
Diuretic disch	11 (28%)	14 (78%)	0.06
LVEF baseline, mean (SD)	58.3 (11.1)	57.8 (10.9)	0.88
LVEF adm, mean (SD)	29.0 (12.7)	28.2 (12.3)	0.86
LVEF disch, mean (SD)	11.0 (12.7)	11.1 (12.9)	0.87
LVH interval post, mean (SD)	232.4 (106.0)	196.3 (103.2)	0.13
Baseline QRS axis, mean (SD)	27.6 (74.0)	22.9 (45.0)	0.81
QRS post, mean (SD)	138.4 (122.3)	132.3 (125.1)	0.40
Baseline left axis deviation, mean (SD)	11 (28%)	3 (17%)	0.57
Baseline left anterior fascicular block	5 (13%)	0 (0%)	0.12
New LAFB post	1 (3%)	0 (0%)	0.50
Baseline left posterior fascicular block (NO)	40 (100%)	18 (100%)	
New LFPB post (NO)	40 (100%)	18 (100%)	
Baseline incomplete RBBB	1 (3%)	1 (6%)	0.56
New incomplete RBBB post (NO)	40 (100%)	18 (100%)	
Baseline QRS	1 (3%)	1 (6%)	0.56
New QRS post	2 (5%)	0 (0%)	0.13
Baseline Mobitz I	1 (3%)	0 (0%)	0.50
New Mobitz I post (NO)	40 (100%)	18 (100%)	
Baseline Mobitz II (NO)	40 (100%)	18 (100%)	
New Mobitz II post (NO)	40 (100%)	18 (100%)	
CHB on post TAVR EKG	0 (0%)	2 (11%)	0.04

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