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ORIGINAL RESEARCH

Baseline ECG and Prognosis After Transcatheter Aortic Valve Implantation: The Role of Interatrial Block

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BACKGROUND: The clinical significance of conduction disturbances after transcatheter aortic valve implantation has been described; however, little is known about the influence of baseline ECGs in the prognosis of these patients. Our aim was to study the influence of baseline ECG parameters, including interatrial block (IAB), in the prognosis of patients treated with transcatheter aortic valve implantation.

METHODS AND RESULTS: The BIT (Baseline Interatrial Block and Transcatheter Aortic Valve Implantation) registry included 2527 patients with aortic stenosis treated with transcatheter aortic valve implantation. A centralized analysis of baseline ECGs was performed. Patients were divided into 4 groups: normal P wave duration (<120 ms); partial IAB (P wave duration ≥120 ms, positive in the inferior leads); advanced IAB (P wave duration ≥120 ms, biphasic [+/–] morphology in the inferior leads); and nonsinus rhythm (atrial fibrillation/flutter and paced rhythm). The mean age of patients was 82.6±9.8 years and 1397 (55.3%) were women. A total of 960 patients (38.0%) had a normal P wave, 582 (23.0%) had partial IAB, 300 (11.9%) had advanced IAB, and 685 (27.1%) presented with nonsinus rhythm. Mean follow-up duration was 465±171 days. Advanced IAB was the only independent predictor of all-cause mortality (hazard ratio [HR], 1.48; 95% CI, 1.10–1.98 [*P*=0.010]) and of the composite end point (death/stroke/new atrial fibrillation) (HR, 1.51; 95% CI, 1.17–1.94 [*P*=0.001]).

CONCLUSIONS: Baseline ECG characteristics influence the prognosis of patients with aortic stenosis treated with transcatheter aortic valve implantation. Advanced IAB is present in about an eighth of patients and is associated with all-cause death and the composite end point of death, stroke, and new atrial fibrillation during follow-up.

Key Words: ECG ■ interatrial block ■ pacemaker ■ prognosis ■ TAVI ■ TAVR

Transcatheter aortic valve implantation (TAVI) is increasingly common for treating patients with severe aortic stenosis. Compared with surgical aortic valve replacement, TAVI was associated with a lower risk for all-cause mortality or disabling stroke within 2 years in a recent meta-analysis.[1] The indications for percutaneous valve replacement are being extended, even to patients with a low surgical risk.[2]

Several authors have suggested that interatrial block (IAB), particularly advanced IAB, could be a

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For Sources of Funding and Disclosures, see page 8.

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CLINICAL PERSPECTIVE

What is New?

- Advanced interatrial block is present in about an eighth of patients treated with transcatheter aortic valve implantation and is associated with all-cause death and the composite end point of death, stroke, and atrial fibrillation.
- We did not find an association with the need for a permanent pacemaker.

What are the Clinical Implications?

- A simple inexpensive measurement of surface ECG could contribute to better risk stratification in patients who are treated with transcatheter aortic valve implantation.

Nonstandard Abbreviations and Acronyms

BIT	Baseline Interatrial Block and Transcatheter Aortic Valve Implantation
IAB	interatrial block
TAVI	transcatheter aortic valve implantation

precursor of atrial fibrillation (AF), stroke, and mortality[3,4] in different clinical scenarios.[4–9] IAB is defined as a prolonged P wave duration (≥120 ms). In partial IAB, the P wave is positive in the inferior leads, while, in advanced IAB, the P wave has a biphasic (+/–) pattern in the inferior leads. IAB is more common in elderly patients, but the prevalence of IAB in patients undergoing TAVI, and its clinical implications, are unknown. In advanced IAB, impulses are not conducted by the Bachmann bundle. Left atrial activation is retrograde through the coronary sinus musculature and the fossa ovalis. The delayed left atrial contraction occurs against a closed mitral valve, producing an increase in atrial pressure and promoting atrial dilation and fibrosis.[10]

Changes in the conduction tissue after the procedure constitutes one of the main limitations of TAVI, generating the need for a definitive pacemaker in a nonnegligible percentage of patients.[11] Some predictors for permanent pacemaker implantation have been described, such as age, septal wall thickness, longer QRS duration, preexisting right bundle-branch block, prosthesis oversizing, mitral annular calcification, postdilatation during TAVI implantation, or self-expandable prosthesis,[12–14] but information on this matter is still insufficient, particularly with respect to the influence of baseline ECG parameters.

To date, no study has specifically analyzed the role of IAB as a prognostic predictor in patients with aortic stenosis undergoing TAVI. Our aim was to determine the association of preexisting IAB with long-term prognosis in patients who received TAVI for aortic valve replacement. We also aimed to determine the potential relationship between IAB and pacemaker implantation after TAVI.

METHODS

The design of the BIT (Baseline Interatrial Block and Transcatheter Aortic Valve Implantation) registry has been published.[15] Briefly, we included patients treated with TAVI in 10 Spanish academic centers. The primary end point was the requirement of a permanent pacemaker during post-TAVI hospitalization. Secondary end points included the incidence of new-onset AF, stroke, or mortality during 12-month follow-up. Inclusion criteria were: (1) ECG performed in the 24 hours before TAVI, and (2) TAVI procedure for aortic valve stenosis. The only exclusion criterion was to have an ineligible ECG. Trained personnel using standard case report forms collected all data prospectively. The last ECG performed before TAVI implantation was retrospectively collected and clinical data were collected using a standardized form centrally analyzed. Patients were prospectively followed up. The ECG image was amplified up to 20 times its original size to define the interval between the earliest and the latest detection of atrial depolarization in the frontal leads, defined as a positive or negative deflection, respectively, that deviates from the baseline before the QRS complex. All ECGs were recorded with a standardized protocol and settings (25 mm/s and 10 mm=1 mV). The last ECG available before TAVI implantation was used. P wave duration and the presence of IAB was manually measured and assessed using GeoGebra 4.2 software (Informer Technologies, Inc) after amplifying up to 20 times its original size. GeoGebra is mathematical software that allows high accuracy measurements[16] and has been used to accurately measure P wave duration.[17]

Blinded ECG analysis was performed in the core laboratory of the *Fundación Investigación Cardiovascular/Programa-ICCC Cardiovascular, Institut de Recerca del Hospital de la Santa Creu i Sant Pau,* Barcelona, Spain. Patients were divided into 3 groups: normal P wave duration (<120 ms); partial IAB (P wave duration ≥120 ms, positive in the inferior leads); advanced IAB (P wave duration ≥120 ms, biphasic [+/–] morphology in the inferior leads) (Figure 1); and nonsinus rhythm (AF/flutter and paced rhythm). Heart failure (HF) was defined according to European Society of Cardiology guidelines.[18]

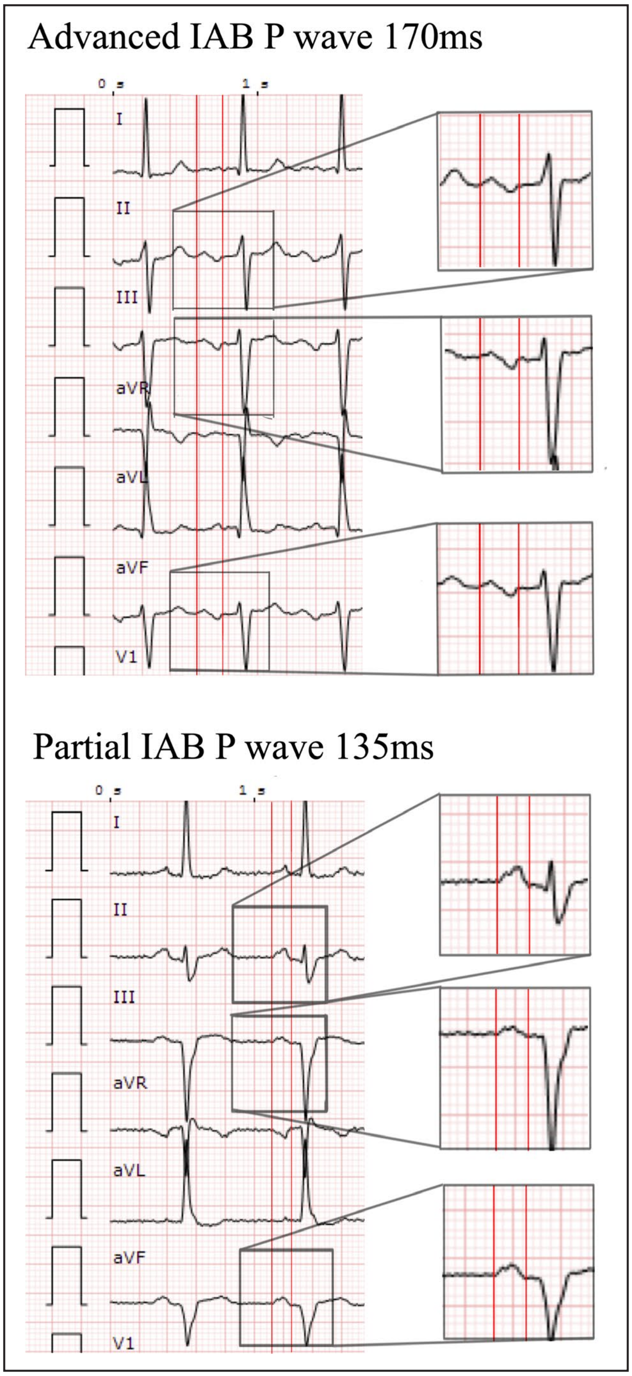

Figure 1. Examples of ECGs with partial and advanced interatrial block (IAB).

TAVI valve models were divided into 2 main groups according to the implant technique: self-expandable/mechanically expandable (Evolut [Medtronic], Allegra [New Valve Technology], Acurate [Boston Scientific Corporation], Engager [Medtronic], Portico [Abbott], Lotus [Boston Scientific Corporation], JenaValve [JenaValve Technology, Inc.]), and balloon-expandable prostheses (Sapien [Edwards Lifesciences Corporation]).

Our study complies with the Declaration of Helsinki, and was approved by the ethics committee of the Germans Trias i Pujol University Hospital, Badalona, Barcelona, Spain. Informed consent was obtained from all participants. Methods used in the analysis and materials used to conduct the research will be made available to any researcher.

Statistical Analysis

Categorical variables are expressed as number (percentage). Continuous variables are expressed as mean±SD. Normality in the distribution of continuous variables was analyzed with the Kolmogorov-Smirnov test. The differences between categorical variables were analyzed through the chi-square test, with continuity correction if indicated. The differences between continuous variables were analyzed using the Student *t* test. For the analysis of the impact of IAB on the need to implant a permanent pacemaker after TAVI, a binary logistic regression model was used. For the analysis of the impact of IAB in the combination of new-onset AF, stroke, or death, a Cox regression model was used. Charlson comorbidity index was calculated but the component variables were also individually considered during the modeling process. The variable selection method was made based on clinical justification, including all candidate predictors associated with outcome clinically and biologically as a first step. To determine which variables were entered into the final model, we used a sequential inclusion and exclusion method, with an inclusion *P* threshold <0.05 and exclusion >0.1. Statistical package STATA 14.0 (StataCorp LLC) was used to perform all statistical analysis.

RESULTS

During the study period, a total of 2527 patients undergoing TAVI implantation were included in the registry. The mean age of patients was 82.6±9.8 years, and 1397 (55.3%) were women. IAB was present in 882 patients (34.9%) before TAVI. Mean follow-up duration was 465±171 days. Table 1 shows basal demographic characteristics and ECG parameters according to the presence and type of IAB (partial in 582 patients [23.0 %], advanced in 300 patients [11.9%]). AF/flutter was present in 560 patients (22.1%), and 125 had a paced rhythm (4.9%). Patients with IAB were older than patients without IAB, but Charlson comorbidity index[19] was similar in patients with no IAB, partial/advanced IAB, and AF. Previous HF was more common in patients with advanced IAB (65.0%) compared with those with partial IAB (63.9%), those with a normal P wave (55.2%), or those with

Table 1. Baseline Characteristics According to the Presence and Type of IAB

	Normal P Wave n=960	Partial IAB n=582	Advanced IAB n=300	Nonsinus Rhythm* n=685	*P* Value
Age, y	82.1±9.1	82.6±10.1	84.4±9.2	82.6±10.5	0.005
Women	545 (56.8)	314 (54.0)	167 (55.7)	371 (54.2)	0.650
Hypertension	775 (80.7)	502 (86.2)	266 (88.7)	586 (85.6)	0.001
Dyslipidemia	606 (63.1)	382 (65.6)	204 (68.0)	421 (61.5)	0.173
History of myocardial infarction	141 (14.7)	111 (19.1)	45 (15.0)	90 (13.1)	0.031
History of HF	530 (55.2)	371 (63.9)	195 (65.0)	417 (60.9)	0.001
Peripheral arterial disease	141 (14.7)	84 (14.4)	41 (13.7)	89 (13.0)	0.786
Dementia	44 (4.8)	20 (3.5)	7 (2.4)	23 (3.4)	0.194
Connective tissue disorder	46 (5.6)	32 (6.6)	15 (6.4)	33 (5.3)	0.785
Diabetes mellitus	302 (31.5)	169 (29.0)	90 (30.0)	210 (30.7)	0.789
Previous oral anticoagulation	192 (20.0)	135 (23.2)	68 (22.7)	411 (60.0)	<0.001
Creatinine, mg/dL	0.9±0.3	1.0±0.7	1.0±0.5	1.0±0.4	0.129
Pacemaker	58 (6.1)	34 (5.8)	32 (10.7)	125 (18.3)	<0.001
Chronic obstructive pulmonary disease	205 (21.4)	127 (21.8)	74 (24.7)	156 (22.8)	0.653
Charlson comorbidity index	5.7±1.7	5.8±1.6	5.9±1.4	5.8±1.5	0.147
Negative chronotropes	307 (41.2)	225 (50.8)	114 (46.3)	299 (61.5)	<0.001
Previous aortic stenosis symptoms	945 (98.5)	576 (99.0)	294 (98.3)	677 (98.8)	0.818
Left ventricular ejection fraction, %	58.7±12.4	58.2±12.7	58.6±12.8	57.0±12.6	0.051
Mean transaortic gradient, mm Hg	47.5±14.9	47.6±14.6	48.2±14.3	44.8±14.1	0.003
Aortic area, cm^2	0.68±0.39	0.67±0.19	0.68±0.16	0.68±0.43	0.986
Moderate-severe mitral regurgitation	362 (38.4)	258 (44.8)	114 (38.6)	288 (42.7)	0.043
Severe aortic regurgitation	335 (34.9)	235 (40.5)	119 (39.8)	255 (37.2)	0.132
Interventricular septum, mm	12.2±4.2	12.7±4.2	13.0±3.9	12.4±4.4	0.042
Porcelain aorta	64 (7.1)	39 (6.9)	15 (5.2)	44 (6.5)	0.712
Percutaneous revascularization					
Complete	142 (19.5)	92 (23.5)	29 (13.1)	72 (14.5)	
Incomplete	88 (12.1)	66 (16.8)	47 (21.3)	65 (13.1)	<0.01
Heart rate	72.2±13.1	71.0±13.5	68.8±12.1	75.2±17.5	<0.001
Type of TAVI					
Self-expandable	694 (72.3)	428 (73.5)	215 (71.7)	475 (69.3)	
Balloon-expandable	266 (27.7)	154 (26.5)	85 (28.3)	210 (30.7)	0.390
Prosthetic size, mm	26.6±2.9	26.9±2.7	27.0±2.6	26.9±2.7	0.022
Postdilatation	215 (23.8)	153 (26.9)	82 (28.3)	148 (21.7)	0.071
Valve-in-valve	43 (4.5)	24 (4.1)	9 (3.0)	43 (6.3)	0.101
ECG					
Right bundle-branch block	102 (10.6)	67 (11.5)	34 (11.3)	55 (8.0)	0.143
Left bundle-branch block	86 (9.0)	68 (11.7)	33 (11.0)	33 (4.8)	<0.001
P duration, ms	64.3±41.6	136.8±16.5	144.4±20.6	…	<0.001
PR duration, ms	164.2±46.1	198.5±47.9	208.4±44.6	177.4±56.6	<0.001
QRS duration, ms	97.5±37.9	103.6±40.9	98.1±41.0	100.0±37.8	0.0239
QTc interval, ms	428.7±55.9	436.7±59.8	427.2±57.0	424.6±84.4	0.014
RR interval, ms	471.4±77.5	474.7±72.5	451.5±71.9	469.4±83.4	0.002

Data are shown as number (percentage) for categorical variables and mean±SD for continuous variables. HF indicates heart failure; IAB, interatrial block; and TAVI, transcatheter aortic valve implantation.

*Includes 560 patients with atrial fibrillation/atrial flutter and 125 patients with pacemakers. PR interval in paced rhythm was 187.9±63.0 ms. P wave duration in paced rhythm was 96.6±54.0 ms.

AF/paced rhythms (60.9%). Patients with IAB had a thicker interventricular septum than patients with normal P wave. In the nonsinus rhythm group, oral anticoagulation was more common in patients with AF than in those with pacemakers (385 [68.8%] versus 26 [20.8%], *P*<0.001).

Table 2. Independent Predictors of Pacemaker Implantation During Hospital Admission*

	OR (95% CI)	*P* Value
Normal P wave	1	...
AF	1.18 (0.67–2.07)	0.563
Partial	1.10 (0.71–1.71)	0.273
Advanced	0.97 (0.55–1.70)	0.902
TAVI		
Balloon-expandable	1	
Self-expandable	1.78 (1.01–3.25)	0.048
Right bundle-branch block at baseline	2.47 (1.56–3.92)	<0.001
Previous HF	1.49 (1.05–2.25)	0.0498

*Interatrial block was not associated with pacemaker implantation. AF indicates atrial fibrillation; HF, heart failure; OR, odds ratio; and TAVI, transcatheter aortic valve implantation.

We did not find significant differences in the rate of pacemaker implantation in the 3 groups of patients according to IAB during admission/follow-up. Most pacemaker implants occurred in the first days after the TAVI procedure. The median time to pacemaker implantation was 4 days, and in patients who required a pacemaker, 3 of 4 underwent implantation in the first 8 days after TAVI. The length of hospital stay was longer in patients who required a permanent pacemaker during hospital admission (12.5±2.0 days), compared with those who did not require a pacemaker (9.2±0.3 days) (*P*=0.01). IAB was not associated with pacemaker implantation during hospitalization (Table 2), or follow-up (Figure 2). Figure 1 and analyses regarding pacemaker implantation exclude patients with a preexisting pacemaker.

Among patients with HF, the frequency of pacemaker implantation was higher in patients treated with self-expandable valves than in those with balloon-expandable valves (117 [9.5%] versus 11 [3.8%], respectively; *P*=0.001). HF was associated with pacemaker implantation after TAVI (OR, 1.49; 95% CI, 1.05–2.25 [*P*=0.0498]). Self-expandable valves were also associated with a higher frequency of pacemaker implantation after TAVI (OR, 1.78; 95% CI, 1.01–3.25 [*P*=0.048]).

In-hospital death in patients with partial IAB was slightly higher than in those with advanced IAB, without a significant difference (39 [6.7%] versus 16 [5.4%], respectively; *P*=0.555). This was also the case with death during follow-up (134 [23.2%] versus 61 [20.4%], respectively; *P*=0.558).

The number of hospital readmissions and deaths were higher in patients with IAB compared with those with a normal P wave (Table 3). The rate of early deaths (<30 days) was similar in patients with IAB and those with a normal P wave, but late deaths were more common among patients with IAB. A similar tendency was seen for the composite outcome of death/stroke/AF. Table 4 shows the independent predictors of the main study end points during follow-up. IAB and Charlson comorbidity index were the only 2 independent predictors of the combined end point of death/stroke/incident AF (Figure 3), and were also the only 2 independent predictors of all-cause death (Figure 4). The association of advanced IAB with outcomes was similar in the 2 type of valves, and the type of valve was not associated with all-cause death (hazard ratio [HR], 1.01; 95% CI, 0.89–1.36 [*P*=0.38]) or with the composite end point of death, stroke, and AF (HR, 1.13; 95% CI, 0.92–1.38 [*P*=0.24]).

Advanced IAB and Charlson comorbidity index were the only 2 independent predictors of the combined end point of death/stroke/incident AF (Figure 3), and were also the only 2 independent predictors of all-cause death (Figure 4).

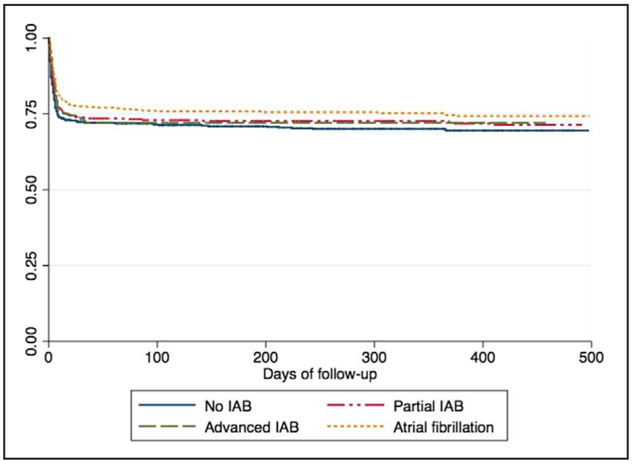

Figure 2. Kaplan-Meier curves addressing pacemaker implantation after transcatheter aortic valve implantation according to the presence of interatrial block (IAB).

DISCUSSION

In this large real-life registry in patients who underwent TAVI, we found that advanced IAB is present in about an eighth of the patients and is associated with all-cause death and with the composite end point of death, stroke, and AF. IAB was not associated with an increased need for a permanent pacemaker. Patients with right bundle-branch block at baseline, HF, and self-expandable valves, were at increased risk of requiring a permanent pacemaker.

Aortic stenosis is the most frequent valve disease in the elderly, and TAVI is becoming the therapy of choice in most symptomatic patients. IAB reflects a deterioration of interatrial conduction and has been associated with an increased incidence of AF.[9,20] There is growing evidence that IAB, particularly

Table 3. Events During Follow-Up According to the Presence and Type of IAB

	Normal P Wave n=960	Partial IAB n=582	Advanced IAB n=300	Nonsinus Rhythm n=685	*P* Value
Pacemaker implantation after TAVI	224 (23.8)	125 (22.0)	63 (21.5)	136 (20.3)	0.420
Pacemaker implantation during TAVI hospitalization	62 (6.5)	46 (7.9)	20 (6.7)	43 (6.3)	0.670
Pacemaker implantation after discharge from TAVI hospitalization	162 (16.9)	79 (13.6)	43 (14.3)	93 (13.6)	0.193
New-onset AF	70 (7.5)	54 (9.8)	29 (10.3)	…	0.176
Stroke	52 (5.7)	31 (5.4)	18 (6.3)	31 (4.6)	0.667
Hospital admission during follow-up	423 (44.1)	276 (47.4)	136 (45.3)	358 (52.3)	0.010
No. of hospital readmissions	0.7±1.2	0.9±1.5	1.0±1.9	1.1±1.7	<0.001
Death during hospital admission	49 (5.1)	39 (6.7)	16 (5.4)	55 (8.1)	0.102
Death during follow-up	171 (17.9)	134 (23.2)	61 (20.4)	119 (17.5)	0.039
Early deaths (<30 d)	106 (11.0)	65 (11.2)	27 (9.0)	86 (12.6)	0.424
Late deaths (>30 d)	114 (11.9)	108 (18.6)	50 (16.7)	88 (12.8)	0.046
Early death/stroke/AF (<30 d)	60 (6.3)	38 (6.5)	20 (6.7)	42 (6.1)	0.985
Late death/stroke/AF (>30 d)	240 (25.0)	181 (31.0)	84 (28.0)	177 (25.8)	0.06

Data are shown as number (percentage) for categorical variables and mean±SD for continuous variables.
AF indicates atrial fibrillation; IAB, interatrial block; and TAVI, transcatheter aortic valve implant

advanced IAB, is a powerful marker of increased risk of a poor outcome[3,4] in different clinical scenarios, such as HF,[21] acute coronary syndromes,[3] stress cardiomyopathy,[4] and ischemic stroke.[22] Our data confirm that this is also the case in patients with aortic stenosis treated with TAVI.

The mechanisms underlying the higher mortality in patients with advanced IAB are not completely understood. We found that comorbidity was similar in patients with TAVI regardless of IAB, according to the Charlson comorbidity index. In our population of patients treated with TAVI, we were unable to detect an independent association of advanced IAB with AF or stroke. This could be related to the fact that patients with severe aortic stenosis might have an increase in left atrial pressure regardless of the presence of IAB. In fact, in the only previous study of IAB in patients with TAVI, Alexander et al,[6] in a small sample of 62 patients, did not find a significant association between IAB and AF. In addition, almost a quarter of our patients already had AF/flutter at baseline. Stroke incidence was lower in patients with AF, probably related to the protective effect of previous oral anticoagulation in this group.

We found a trend toward higher AF in patients with IAB, both partial and advanced. Continuous ECG monitoring was not routinely performed and could be the reason for the low number of episodes of AF identified.

Previous studies have shown that advanced IAB is associated with an increase in all-cause mortality.[23] This might be related to the higher risk of AF and thromboembolic events caused by atrial dilation and blood stasis but also by an inflammatory and profibrotic state.[23] Patients with advanced IAB presented with more common comorbidities (history of HF), although the increase in mortality was also noted in multivariate analysis. After adjusting for confounders, advanced IAB was an independent predictor of death during follow-up and the composite end point (death/stroke/incident AF), but this was not the case with partial IAB. Patients with partial IAB more often presented with variables associated with a worse prognosis such as history of ischemic heart disease, lower left ventricular ejection fraction, mitral regurgitation, greater presence of symptoms of aortic stenosis, and lower aortic area. Previous HF was not an independent predictor of death during follow-up as it was probably associated with aortic stenosis, which was treated with TAVI.

One of the limitations of TAVI is the damage of conduction tissue that can lead to the need for a permanent pacemaker. This complication varies depending on the series and type of prosthesis used, ranging between 15% and 30%.[24] A total of 22% of our patients required a permanent pacemaker. Although several predictors of post-TAVI conduction disorders have been described,[25] previous HF history is not one of them. We found that HF history was an independent predictor of pacemaker implantation. The reason for this is unknown, but it is possible that some of these patients had some added condition (eg, transthyretin cardiac amyloidosis).[26] In addition, HF-related therapies, such as β-blockers, could play a role. Right bundle-branch block was also associated with pacemaker implantation, as in previous studies.[27]

Table 4. Independent Predictors of the Main Study Outcomes During Follow-Up

	Hazard Ratio (95% CI)	*P* Value
Pacemaker implantation		
Age	1.07 (1.02–1.11)	0.004
Right bundle-branch block	3.04 (1.02–3.10)	0.047
Interatrial block		
Normal P wave	1	
Partial	1.43 (0.46–4.43)	0.535
Advanced	1.46 (0.26–3.9)	0.201
Nonsinus rhythm	1.37 (0.47–3.57)	0.562
Stroke		
Interatrial block		
Normal P wave	1	
Partial	0.92 (0.57–1.50)	0.747
Advanced	0.81 (0.43–1.50)	0.498
Nonsinus rhythm	0.83 (0.51–1.34)	0.459
Incident AF	1.83 (1.03–3.24)	0.038
Moderate-severe mitral regurgitation	0.51 (0.33–0.81)	0.005
Incident AF		
Previous HF	1.54 (1.02–2.35)	0.041
Interatrial block		
No	1	
Partial	1.43 (0.82–2.50)	0.136
Advanced	1.70 (0.85–3.41)	0.397
Nonsinus rhythm	...	
Death during follow-up		
Interatrial block		
No	1	
Partial	1.13 (0.88–1.46)	0.319
Advanced	1.43 (1.04–1.98)	0.029
Nonsinus rhythm	1.07 (0.82–1.37)	0.501
Charlson comorbidity index	1.08 (1.01–1.15)	0.010
Diabetes mellitus	1.62 (1.17–2.27)	0.004
Composite end point (death/stroke/incident AF)		
Interatrial block		
No	1	
Partial	1.04 (0.83–1.33)	0.701
Advanced	1.60 (1.20–2.14)	0.001
Nonsinus rhythm	1.06 (0.84–1.33)	0.629
Charlson comorbidity index	1.07 (1.01–1.14)	0.020

AF indicates atrial fibrillation; and HF, heart failure.

This study has some limitations. All of our data come from academic hospitals in Spain and might not be extrapolated to other centers. The mean follow-up (1.3 years) might be considered short to detect associations of advanced IAB with AF and stroke. However, our study is the first to describe an association between the presence of advanced IAB and prognosis in patients treated with TAVI. This association could have clinical relevance, as a simple inexpensive measurement of surface ECG could contribute to better risk stratification in this clinical scenario.

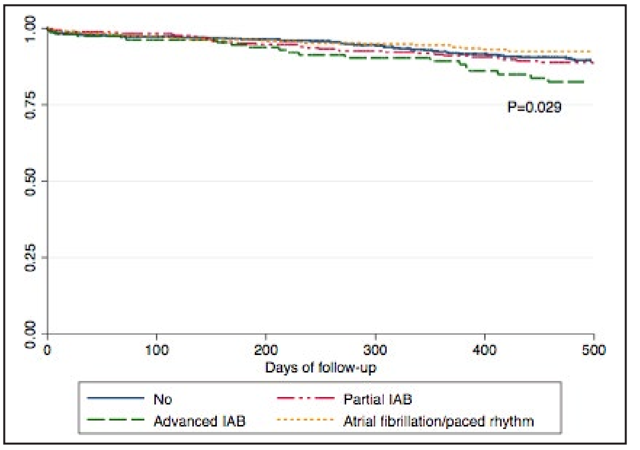

Figure 3. Kaplan–Meier curves addressing the composite end point of death, stroke, and new atrial fibrillation after transcatheter aortic valve implantation according to the presence of interatrial block (IAB).

CONCLUSIONS

Baseline ECG characteristics influence the prognosis of patients with aortic stenosis treated with TAVI. Advanced IAB (P wave duration ≥120 ms with biphasic morphology in inferior leads) is present in about an eighth of patients and is associated with all-cause death and with the composite end point of death, stroke, and new AF during follow-up. Future studies should address the mechanisms that explain this association.

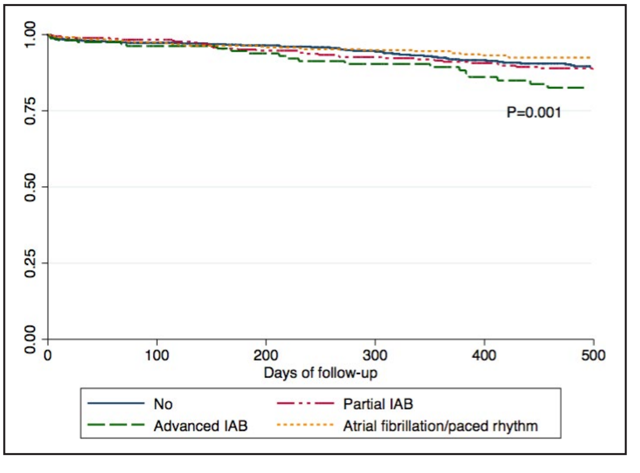

Figure 4. Kaplan–Meier curves addressing all-cause death after transcatheter aortic valve implantation according to the presence of interatrial block (IAB).

APPENDIX

List of centers and investigators (all centers located in Spain)

Hospital de la Santa Creu i Sant Pau, Barcelona: Antonio Serra, Dabit Arzamendi, Xavier Millán, and Xavier Armario. Hospital General Universitario Gregorio Marañón, Madrid: Clara Fernández-Cordón and Hugo González-Saldivar (HGS is now at the Instituto Nacional de Cardiología. Hospital San Jorge, Hospital de Clínicas—Asunción—Paraguay), Felipe Díez-delHoyo, Lilian Grigorian, Miriam Juárez, M. Eugenia Vázquez, Ricardo Sanz, Javier Soriano, Enrique Gutiérrez, Jaime Elízaga, Francisco Fernández-Avilés, and Manuel Martínez-Sellés. Hospital Universitario de La Princesa, Madrid: Pablo Díez-Villanueva, Teresa Alvarado Casas, Fernando Rivero Crespo, and Fernando Alfonso. Hospital Universitario Doce de Octubre, Madrid: Lourdes Vicent, Agustín Albarrán González de Trevilla, Julio García Tejada, Iván Tomás Gómez Blázquez, and Fernando Sarnago. Bellvitge University Hospital, Barcelona: Albert Ariza Sole and Carme Guerrero Morales. Hospital Universitario Central de Asturias, Oviedo: Ana Ayesta, Pablo Avanzas, Yvan Persia, and Cesar Moris. Hospital Clínico San Carlos, Madrid: Gabriela Tirado-Conte, Javier Cobiella, and Luis Nombela-Franco. Complexo Hospitalario Clínico Universitario de Santiago de Compostela: Diego López Otero, Xoan Carlos Sanmartin Pena, and Javier Lopez Pais. Hospital Universitario Virgen de la Victoria, Málaga: Juan José Gómez-Doblás, Antonio Muñoz, Erika Muñoz, and José María Hernández. Hospital Universitari Germans Trias i Pujol Badalona, Barcelona: Edgar Fadeuilhe Grau and Eva Bernal.

ARTICLE INFORMATION

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Disclosures

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