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Letters

Heart Block After Discharge in Patients Undergoing TAVR With Latest-Generation Valves

Heart block (HB) after transcatheter aortic valve replacement (TAVR) continues to be a concerning complication—requiring pacemaker implantation, necessitating long-term device monitoring, and contributing to higher 30-day mortality. Prior studies have described periprocedural risk factors associated with requirement for permanent pacing after TAVR (1). Data have established risk factors for HB in older-generation valves, including: 1) pre-existing conduction disturbances, particularly right bundle branch block; 2) transient HB intraprocedure; and 3) use of self-expanding valves (2). Yet, these studies have focused on periprocedural development of conduction disturbances with little description of post-discharge HB.

Even less is known about the risk of conduction disturbances associated with newer-generation TAVR valves—SAPIEN 3 (Edwards Lifesciences, Irvine, California) and Evolut-R (Medtronic, Dublin, Ireland)—approved for use in the summer of 2015. With rapid evolution of valve technology, design profiles between these 2 transcatheter valves have converged, perhaps altering described rates of HB associated with each system (3). With expanding indications and use of TAVR, understanding conduction disturbances associated with newer valves could significantly improve patient safety.

In summer 2016, we took notice of several patients who underwent uncomplicated TAVR with newest-generation valves without baseline or periprocedural conduction disturbances or change in conduction post-TAVR and subsequently presented with HB after discharge. We report our experience with such patients presenting with advanced conduction disease post-discharge after undergoing TAVR with both valves.

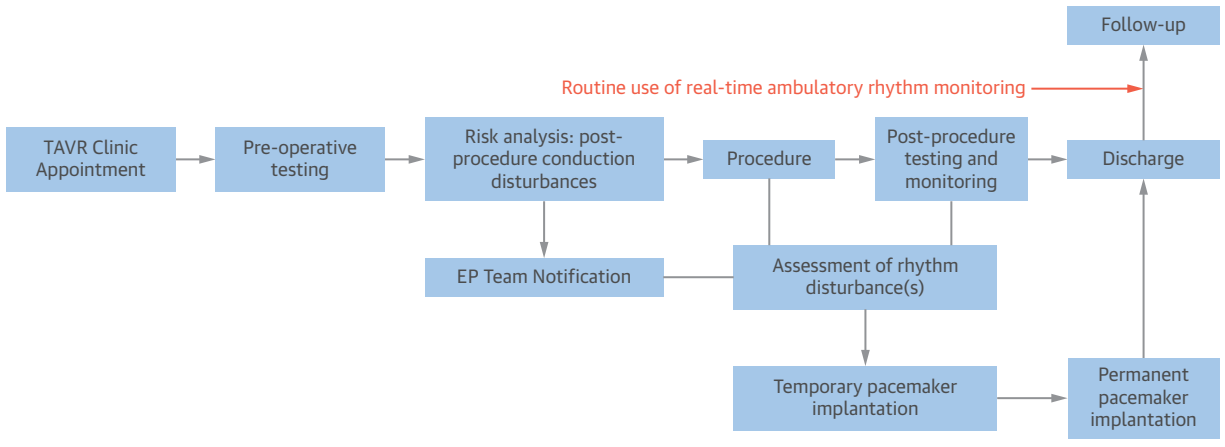
From July 2015 to November 2016, 158 patients (none with existing pacemakers) underwent TAVR at our institution, of which 103 (65%) and 55 (35%) received SAPIEN 3 and Evolut-R systems, respectively. Of patients undergoing SAPIEN 3 and Evolut-R implantations, 9 (8.7%) and 14 (25%) required inpatient pacemaker placement, respectively. Four patients re-presented with late HB following uncomplicated TAVR (SAPIEN 3: n = 3, Evolut-R: n = 1). All had unchanged periprocedural electrocardiograms (ECGs) with normal QRS intervals on discharge. Valve sizes ranged from 26 to 29 mm, average hospital duration was 48 h, and mean time to readmission was 9 days (range 8 to 10 days). Three of 4 patients received prompt treatment with dual-chamber pacemakers and 1 died from intracranial hemorrhage as a result of syncope.

Given the lack of periprocedural electrocardiographic changes noted in those presenting with high-grade conduction disease after discharge, in October 2016, we instituted routine use of real-time ambulatory rhythm monitoring for 30 days (LifeWatch ACT Ex [LifeWatch, Zug, Switzerland] with real-time ECG analysis) in all patients undergoing TAVR at our institution (**Figure 1**). Patients were seen at their routine post-TAVR clinic appointment at approximately 1 month or contacted if deemed necessary by rhythm analysis. Since implementation, 38 patients have undergone uncomplicated TAVR without the need for post-procedure pacemaker implantation and been discharged with rhythm monitoring. HB was then identified in 7 patients (SAPIEN 3: n = 4, Evolut-R: n = 3) between days 2 and 24 through ambulatory rhythm monitoring. Four of 7 patients had no baseline conduction system disease or change between pre-procedure and discharge ECG. A total of 2 of 7 patients noted mild pre-syncopal symptoms in addition to malaise and fatigue.

Relative to older-generation valves, newer valves show similar inpatient pacemaker implantation rates post-deployment. Importantly, we report the development of high-grade conduction disease after discharge without change in baseline periprocedural conduction. Converse from higher inpatient pacemaker implantation rates seen with self-expanding valves, in this small series, we note similar rates of HB post-discharge between valve types.

The mechanism of delayed HB remains unclear. The clustering of cases with late HB at 8 to 10 days is far removed from the timeframe of early changes in

FIGURE 1 Heart Block After Discharge in Patients Undergoing TAVR With Latest-Generation Valves



The figure depicts current transcatheter aortic valve implantation (TAVR) workflow with noted changes to improve recognition of rhythm disturbances post-discharge. EP = electrophysiology.

nitinol stent expansion (Evolut-R) or cuff swelling (SAPIEN 3). Prior studies have shown a relationship between depth of deployment with newer valves and risk of periprocedural heart block (4), yet the patients we report underwent uneventful valve deployment with aortic anatomy delineated by pre-procedural computed tomography imaging.

Although there is potential for under-reporting, all patients undergoing TAVR at our institution are seen in the clinic within 30 days. However, referral bias to our tertiary care center could result in case clustering. In addition, pacing burden after pacemaker implantation in this patient cohort remains unknown. In this focused work, we describe a concerning signal for post-discharge presentation with HB in patients undergoing TAVR with newest-generation transcatheter valves. Periprocedural telemetry may not be sufficient to capture all patients at risk of HB after valve implantation. Accordingly, multiple clinical trials utilizing implantable rhythm monitors to analyze long-term risk of conduction system disease in at-risk TAVR patients are underway. These and further prospective studies incorporating procedural data (e.g., valve position, annular calcification) with short- and long-term rhythm monitoring to detect conduction abnormalities are important next steps in building on the signal shown in this work.

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