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CASE REPORT

Late onset complete heart block after transcatheter aortic valve replacement treated with permanent His-bundle pacing

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1 | INTRODUCTION

Conduction disease (CD) after transcatheter aortic valve replacement (TAVR) is common. Well-recognized predictors for permanent pacemaker implantation (PMI) post-TAVR include male sex, preexisting right bundle branch block, first-degree atrioventricular block, left anterior hemiblock, use of self-expanding valves, and intraoperative AV block. 1–4 The location of complete heart block post-TAVR has been noted to occur both at the level of the AV node and in the His-Purkinje system (infra AV node). 5–7 The majority of CD post-TAVR warranting PMI occurs within the first 7 days, however late occurring CD has also been described. 8–9 Deleterious effects of long-term right ventricular apical pacing have been well established, prompting the need for a more physiologic alternative. 10 His-bundle pacing (HBP) has emerged as a suitable alternative, however, HB mapping can be challenging. 11–12 We present a case of very late occurring CD post-TAVR in which radiographic presence of the TAVR valve facilitated dual chamber PMI with HB pacing.

Abbreviations: CD, conduction disease; HB, His-bundle; HBP, His-bundle pacing; PMI, pacemaker implantation; TAVR, transcatheter aortic valve replacement

2 | CASE REPORT

A 76-year-old woman with hypertension, chronic kidney disease, heart failure with preserved ejection fraction, coronary artery disease, diabetes mellitus, and severe aortic stenosis was referred to our institution. She was determined to be at prohibitive surgical risk due to age and comorbidities and was referred for TAVR. Her baseline electrocardiogram (ECG) was unremarkable, with normal intervals and no CD (Figure 1A). Using a right femoral approach, the patient underwent a 20 mm SAPIEN balloon valvuloplasty and successful placement of a 23 mm Edwards SAPIEN 3 valve with no significant gradient. There were no perioperative or intraprocedural conduction changes from her baseline ECG (Figure 1B). This continued to be the case at 1-month follow-up with remarkable improvement in symptoms compared to pre-TAVR (Figure 1C). Accordingly, she did not undergo any cardiac monitoring postprocedurally. Five months following TAVR, she presented to her cardiologist with new fatigue and dyspnea on exertion, and ECG at that time revealed persistent complete heart block with a junctional escape rhythm (Figure 2A and B). Notably, her ECG also revealed P-wave inversion, suggestive of concomitant sinus node dysfunction as well. The complete heart block was attributed to late onset post-TAVR-related CD. She was then referred for permanent PMI. In
light of the patient’s age, frailty, and comorbidities, HBP was pursued out of concern for future development of left ventricular dysfunction from right ventricular pacing. Our concern was that a future second procedure to add a left ventricular lead or later attempt HB pacing may carry the potential risk of having an occluded access vein and necessitating placement of a new system on the opposite side. A dual-chamber (His-bundle pacing) Medtronic MRI compatible pacemaker was implanted using the Medtronic Secure Select (model 3830) (Minneapolis, MN) lead. The TAVR valve served as a radiographic guide to localize the HB, which was posterior and inferior to the valve (Figure 3A-C). The His capture threshold was 2.2 V at 1 ms. We adjusted her device programing aiming for nonselective His-bundle pacing. At subsequent follow-up, the patient had resolution of her preimplantation symptoms. She remained pacemaker dependent and continued to have preserved left ventricular systolic function.

3 | DISCUSSION

The incidence of CD post-TAVR has not changed despite advances in periprocedural survival and remains a significant source of morbidity and mortality. Up to 90% of CD post-TAVR occurs within the first 30 days postoperatively. Beyond 30 days, very late CD is a rare and feared complication. One large meta-analysis attributed 11% of deaths more than 30 days post-TAVR to sudden cardiac death from very late CD.

Very late occurring CD post-TAVR without preexisting or periprocedurally acquired CD poses an exceptionally troubling patient cohort as risk factors are not yet understood, and the exact mechanism for such late occurring CD is not clear. We believe that elderly patients with severe degenerative aortic valve stenosis are prone to conduction system disease and that TAVR accelerates the process. However, micro-migration or movement of the aortic valve as potential cause of the CD cannot be completely excluded. Therefore, we recommend considering 30-day event monitor post-TAVR and frequent 12-lead ECG monitoring thereafter.

Individual studies have found conflicting results regarding outcomes in TAVR patients who have undergone PMI. However, a recent meta-analysis found an overall harmful effect of PMI on all cause death and heart failure hospitalizations. As HBP has been found to improve quality of life, improve ejection fraction, and reduce heart failure hospitalizations in the general population, it represents an attractive alternative for TAVR patients. Sharma et al studied 30 patients with prosthetic valves undergoing HBP: 12 patients had prosthetic aortic valves,
FIGURE 2  Late development of complete heart block with junctional escape rhythm. A, (Top) ECG from outside cardiologist office; note the presence of inverted P-waves is suggestive of sinus node dysfunction. B, (Bottom) ECG at electrophysiology clinic visit [Color figure can be viewed at wileyonlinelibrary.com]

four of which were via TAVR. The study found prosthetic aortic valves (including TAVR) useful as fluoroscopic landmarks with the HB located inferiorly relative to the valve. Hence, presence of a TAVR valve may improve feasibility of HBP as it serves as a radiographic guide. Future studies should be dedicated to evaluating outcomes of HBP post-TAVR.

4  | CONCLUSION

Very late development of complete heart block post-TAVR without preexisting CD poses a significant concern as a cause of late major adverse events related to TAVR. HBP might be a feasible option in a portion of this patient population, and the valve, itself a fluoroscopic marker, can serve as an asset for His localization.

AUTHOR CONTRIBUTIONS

Study concept and design: Khaled Jamoor and Waddah Maskoun. Drafting of the manuscript: Sati Patel. Critical revision of the manuscript for important intellectual content: Waddah Maskoun. Approval of the article: Arfaat Khan.

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FIGURE 3 A-C, Clockwise: TAVR valve with respect to pacing leads during placement (A) and the following day (B). ECG post-His-bundle pacing (C) [Color figure can be viewed at wileyonlinelibrary.com]

REFERENCES


