Intravascular ultrasound imaging on early and late clinical outcomes following transcatheter aortic valve implantation (TAVI) (1). The authors state that periprocedural permanent ventricular pacing in the PPM group (8).

Second, the PPM implantation strategy in the present study seems rather liberal and early, with almost three-quarters of implantations occurring within 3 days after TAVI. As early atrioventricular conduction disorders post-TAVI are known to recover over time (4–6), a considerable number of patients would have received a PPM unnecessarily. Although scarce, there is some evidence that during longer follow-up of TAVI-related PPM implantations, patients show no or limited pacemaker dependency (7) (unpublished data van der Boon RM, van Mieghem NM, Theuns DA, et al., 2012). Due to alterations in pacing mode, these patients are not exposed to the unfavourable effects of chronic right ventricular pacing.

We recently compared the impact of TAVI-induced left bundle branch block (LBBB) on all-cause mortality during long-term follow-up. In a cohort of 679 patients, all-cause mortality was significantly higher among patients with TAVI-induced LBBB compared with patients without LBBB. Interestingly, the mortality rate among patients receiving PPM after TAVI was comparable to that of patients without TAVI-induced LBBB. This discrepancy could be explained by the low percentage of cumulative ventricular pacing in the PPM group (8).

In conclusion, in the present study by Buellesfeld et al. (1), patient classification might be problematic as the post-TAVI PPM patients are principally heterogeneous and are not all exposed to the risks of (continuous) right ventricular pacing, which might explain the findings of the current study. We agree with the authors that larger-scaled studies are needed to further investigate the impact of PPM after TAVI.

Why Permanent Pacemaker Implantation After Transcatheter Aortic Valve Implantation Does Not Affect Long-Term Clinical Outcome

With interest, we took notice of the paper by Buellesfeld et al. (1) investigating the impact of permanent pacemaker implantation on clinical outcome after transcatheter aortic valve implantation (TAVI) (1). The authors state that periprocedural permanent pacemaker (PPM) implantation does not affect rate of death, stroke, and/or myocardial infarction at 12 months compared with patients with pre-existing PPM or patients without any PPM. Because the findings of present study seem to contrast with earlier observations from the MOST (Mode Selection Trial) study and the DAVID (Dual Chamber and VVI Implantable Defibrillator) trial, we have some concerns regarding the study design (2,3).

First of all, Buellesfeld et al. (1) do not provide a power calculation regarding the study size. Given the relatively low number of patients, it is likely that the study is under-powered to detect differences in the primary endpoint of all-cause mortality. It is plausible than an endpoint combining all-cause mortality with hospitalization for worsening of heart failure would have resulted in different outcome between the groups. Indeed, the MOST and DAVID trials, using similar endpoints, demonstrated that chronic right ventricular pacing is associated with occurrence of heart failure (2,3).

REFERENCES

Key Words: fractional flow reserve  intermediate coronary stenosis  intravascular ultrasound  percutaneous coronary intervention.

Letters to the Editor

Why Permanent Pacemaker Implantation After Transcatheter Aortic Valve Implantation Does Not Affect Long-Term Clinical Outcome

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In conclusion, in the present study by Buellesfeld et al. (1), patient classification might be problematic as the post-TAVI PPM patients are principally heterogeneous and are not all exposed to the risks of (continuous) right ventricular pacing, which might explain the findings of the current study. We agree with the authors that larger-scaled studies are needed to further investigate the impact of PPM after TAVI.

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We thank Dr. Houthuizen and colleagues for their interest in our study (1), which reported that periprocedural permanent pacemaker implantation among patients undergoing transcatheter aortic valve implantation (TAVI) does not affect mortality during follow-up through 1 year. Houthuizen and colleagues are concerned by the lack of a sample size calculation and question the validity of our findings in view of previous pacemaker studies, namely, the MOST (Mode Selection Trial) and the DAVID (Dual Chamber and VVI Implantable Defibrillator) trial (2,3), as well as their own study suggesting a negative prognostic impact of new onset left bundle branch block after TAVI (4).

Our study is the first report to address the impact of permanent pacemaker implantation on mortality among patients undergoing TAVI, and we acknowledge that our findings are exploratory and not conclusive as it was limited to 2 institutions and high-risk patients. The number of patients and accumulated events were small, and 95% confidence intervals of hazard ratios wide. The present study should, therefore, be the impetus to address this issue in prospectively planned larger cohort studies.

The MOST and the DAVID trials have shown a negative impact of right ventricular pacing by increasing heart failure hospitalization but not mortality. Of note, these findings cannot be extrapolated to the issue of permanent pacemaker implantation in the context of TAVI. Both the MOST study and the DAVID trial included only patients with sinus node dysfunction, in whom dual chamber or right atrial pacing would have been technically suitable, alternative pacing modes. Conversely, TAVI-related permanent pacemaker implantation is the result of transient or permanent impairment of atrioventricular (AV) conduction, which was an exclusion criterion for participation in MOST and DAVID. Moreover, patients undergoing TAVI substantially differ from patients included in the MOST and DAVID studies in terms of a higher cardiac risk profile and comorbidities, rendering any extrapolation between these studies inappropriate.

As highlighted in the title of our manuscript, we analyzed the outcome of conduction disorders after transcatheter self-expandable aortic valve implantation. Am J Cardiol 2011;107:747–54.

As with any pacemaker population, the group of patients with a permanent pacemaker after TAVI is highly heterogeneous by nature and consists of patients with various pacemaker indications (high-degree AV block, new-onset left bundle branch block with first-degree AV block, slow atrial fibrillation), variable rates of ventricular stimulation during follow-up, spontaneous recovery of AV conduction no longer requiring a pacemaker, as well as patients with recovery followed by relapse of severe conduction abnormality. Therefore, the results of our study do not provide insights on the clinical relevance of a specific conduction abnormality, but describe the clinical prognosis of the event “TAVI-related pacemaker implantation” under current practice standards. These standards include post-procedural rhythm monitoring for 48 h to allow for AV conduction recovery and avoidance of permanent pacemaker implantation in some patients, but also includes early pacemaker implants in case of severe conduction disturbances, as it effectively precludes deleterious effects related to temporary pacemaker dislocation and bradycardia induced ventricular fibrillation. In fact, a growing body of evidence indicates that TAVI-induced conduction disturbances do not tend to recover over time, supporting an early, aggressive strategy of permanent pacemaker implantation (5).

The negative prognostic impact of left bundle branch block among patients with cardiovascular disease, including ischemic heart disease and dilated cardiomyopathy, has been previously shown, and we read with interest the results of the study by Houthuizen et al. among patients undergoing TAVI. Comparing this study with ours, the results do not contradict but rather complement each other as both studies address the issue of TAVI-induced AV conduction abnormalities but from a different angle. In this context, it is important to realize that patients receiving a permanent pacemaker were specifically excluded from the study by Houthuizen et al. (4), resulting in a different patient population.

Pacemaker implantation is life-saving among patients with high-degree AV conduction abnormalities, and it remains to be seen whether some patients with TAVI-induced left bundle branch block included in the study by Houthuizen et al. (4) would have derived a benefit when implanted with a pacemaker. Given the reports of both recovery as well as late onset of severe conduction disturbances after TAVI, it remains a difficult clinical judgment who should undergo permanent pacemaker implantation. Future efforts with focus both on how to avoid conduction abnormalities and to define TAVI-specific criteria and on how to treat them appropriately once they occur will importantly impact the further evolution of TAVI.

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