JACC: ASIA VOL. 4, NO. 4, 2024

EDITORIAL COMMENT

Left Bundle Branch Block in Aortic Stenosis

Implications Beyond Pacemaker Implantation*

María Tamargo, MD, Enrique Gutiérrez-Ibañes, MD, PhD

Since the inception of transcatheter aortic valve replacement (TAVR) for the treatment of aortic stenosis, one of the main concerns has been how to manage and decrease conduction disturbances.[1] Among them, new-onset left bundle branch block (LBBB) stands out, because not only it is frequent, but also it has been associated with higher rates of permanent pacemaker implantation, heart failure hospitalizations, and all-cause mortality.[2,3] However, the prognostic implications of baseline LBBB have barely been assessed in prior studies, even though it is present in approximately one third of patients with heart failure[4] and is often associated with significant heart disease as the result of myocardial injury, increased cardiac volume, strain, or hypertrophy.[5] These risk factors are highly prevalent in patients with severe aortic stenosis, which may explain the relatively high rate of LBBB in this population. However, the presence of pre-existing LBBB in patients undergoing TAVR has not been considered a risk factor for adverse long-term outcomes in these patients, and in the absence of electrocardiographic changes after valve implantation, it might have been perceived by physicians as a benign bystander.[6] As we move toward TAVR in lower-risk populations with longer lifespans,[7] it is important to address all factors that can influence prognosis.

In this issue of *JACC: Asia*, Saito et al[8] raise a new concern regarding the prognostic implication of pre-existing LBBB. In 5,996 patients undergoing TAVR between 2013 and 2019, the authors assessed the impact of pre-existing LBBB compared with the absence of conduction disturbances and with the development of new-onset LBBB. Interestingly, at 2-year follow-up, patients with pre-existing LBBB had higher overall and cardiovascular mortality than did those with no LBBB; this excess of risk was confirmed in multivariate Cox regression, with a hazard ratio of 1.39 and 1.62 for overall and cardiovascular death. Conversely, post-TAVR LBBB was not associated with increased risk. The group with pre-TAVR LBBB had also higher mortality than the group of patients with post-TAVR LBBB.

Contemporary data on the prognostic impact of preprocedural LBBB on clinical outcomes after aortic valve interventions are limited and heterogeneous. However, a previous analysis of the PARTNER trial showed similar results as the one by Saito et al,[8] with an increased overall and cardiovascular mortality in patients with prior LBBB, which was similar to those with permanent pacemaker implantation.[9] Conversely, 1 study by Fischer et al[10] identified pre-existing LBBB as a risk factor for high-degree atrioventricular block and pacemaker implantation after TAVR but not for increased overall or cardiovascular mortality. One reason for this discrepancy may be that in the study by Saito et al,[8] LBBB could have been acting as a marker of cardiomyopathy. Indeed, in this study the patients with pre-existing LBBB had higher rate of chronic kidney disease, higher preoperative risk; higher left ventricular volumes and brain natriuretic peptide levels, worse NYHA functional class and left ventricular ejection fraction, and almost 20% rate of moderate or severe concomitant mitral regurgitation.[10] All of this seems to point in the direction of more advanced heart failure and cardiomyopathy. Another piece of data supporting this

*Editorials published in *JACC: Asia* reflect the views of the authors and do not necessarily represent the views of *JACC: Asia* or the American College of Cardiology.

From the Department of Cardiology, Hospital General Universitario Gregorio Marañón, Instituto de Investigación Sanitaria Gregorio Marañón, Universidad Complutense, CIBERCV, Instituto de Salud Carlos III, Madrid, Spain.

The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

ISSN 2772-3747 https://doi.org/10.1016/j.jacasi.2024.01.006

hypothesis is that patients with pre-existing LBBB also had worse prognosis than did those with new-onset LBBB. Thus, it appears that it is not only the conduction disturbance but also the underlying myocardium that is causing the increased risk of death.

Concerning the mechanical implications of LBBB, studies have focused on post-TAVR LBBB, and although some have described ventricular asynchrony, others have not. If indeed there is asynchrony, the question remains how to treat LBBB in TAVR patients. The consensus so far recommends monitoring new-onset LBBB after TAVR because of the potential risk of early progression to high atrioventricular block, and suggests electrophysiological study as an additional option.[11] However, there are no standard guidelines to manage pre-existing LBBB. In the absence of prior RBBB or ECG changes after valve implantation, the current consensus includes pre-existing LBBB in group 1 of the Rodes-Cabau et al[6] conduction disturbances classification. The evidence in this group definition suggests that the risk of advanced conduction disturbances beyond 48 hours is very low,[12] and consequently the recommendations include at least 1 day of continuous telemetry and ambulatory monitoring with no further specifications.[13] By contrast, whether we consider LBBB a reflection of cardiomyopathy or a cause for deleterious asynchrony, targeting the asynchronous ventricular activation might palliate the excess in mortality caused by LBBB or high percentages of right ventricular pacing. One of the available treatments of asynchrony is cardiac resynchronization therapy in highly selected patients with heart failure (symptomatic despite optimal medical treatment, reduced left ventricular ejection fraction [≤35%], sinus rhythm, and LBBB with QRS duration >150 ms).[14] Although the majority of patients undergoing TAVR do not qualify for resynchronization therapy criteria, there are case reports supporting the idea of resynchronization in TAVR patients with induced LBBB.[15] A more recent option to mitigate ventricular remodeling is left bundle branch pacing.[16] By achieving a more physiological form of pacing, this therapy has been successfully used to prevent pacing-induced cardiomyopathy in heart failure with high-degree atrioventricular block. A recent report demonstrated that left bundle branch pacing was safe in patients undergoing TAVR with conduction abnormalities, where 11 of 20 patients (55%) received left bundle branch pacing after TAVR because of new-onset LBBB, with improvement of the QRS width and no heart failure hospitalizations during short-term follow-up.[17] Nevertheless, it remains to be clarified whether events in TAVR patients can decrease when an electrical manifestation is treated rather than the substrate itself.

Results as those presented in the work of Saito et al[8] highlight the importance of further research of this pre-existing conduction abnormality, to further assess the effect on prognosis, the organic substrate, the mechanical implications, and the need for specific treatment. New strategies to avoid conduction disturbances and to improve their management are required, particularly with the current trend to expand TAVR to a low-risk population.

FUNDING SUPPORT AND AUTHOR DISCLOSURES

Dr Tamargo was partially supported by grants from the Fundación para la Investigación Biomédica Gregorio Marañón, Spain, and Rio Hortega CM20/00054 from the Instituto de Salud Carlos III, Spain. Dr Gutiérrez-Ibañes has reported that he has no relationships relevant to the contents of this paper to disclose.

ADDRESS FOR CORRESPONDENCE: Dr Enrique Gutiérrez-Ibañes, Department of Cardiology, Hospital General Universitario Gregorio Marañon, Calle Dr Esquerdo 46, 28009 Madrid, Spain. E-mail: enrique.gutierrez@salud.madrid.org.

REFERENCES

1. Auffret V, Puri R, Urena M, et al. Conduction disturbances after transcatheter aortic valve replacement: current status and future perspectives. *Circulation*. 2017;136:1049–1069.

2. Houthuizen P, Van Garsse LAFM, Poels TT, et al. Left bundle-branch block induced by transcatheter aortic valve implantation increases risk of death. *Circulation*. 2012;126:720–728.

3. Nazif TM, Chen S, George I, et al. New-onset left bundle branch block after transcatheter aortic valve replacement is associated with adverse long-term clinical outcomes in intermediate-risk patients: an analysis from the PARTNER II trial. *Eur Heart J*. 2019;40:2218–2227.

4. Siontis GC, Juni P, Pilgrim T, et al. Predictors of permanent pacemaker implantation in patients with severe aortic stenosis undergoing TAVR: a meta-analysis. *J Am Coll Cardiol*. 2014;64:129–140.

5. Francia P, Balla C, Paneni F, Volpe M. Left bundle-branch block: pathophysiology, prognosis, and clinical management. *Clin Cardiol*. 2007;30:110–115.

6. Rodés-Cabau J, Ellenbogen KA, Krahn AD, et al. Management of conduction disturbances associated with transcatheter aortic valve replacement: JACC scientific expert panel. *J Am Coll Cardiol*. 2019;74:1086–1106.

7. Jiménez-Quevedo P, Muñoz-García A, Trillo-Nouche R, et al. Time trend in transcatheter aortic valve implantation: an analysis of the Spanish TAVI

registry. *REC Interv Cardiol Engl Ed*. 2020;2:98–105.

8. Saito T, Inohara T, Tsuruta H, et al. Pre-existing left bundle branch block and clinical outcomes after transcatheter aortic valve replacement. *JACC: Asia*. 2024;4(4):306–319.

9. Dizon JM, Nazif TM, Hess PL, et al. Chronic pacing and adverse outcomes after transcatheter aortic valve implantation. *Heart*. 2015;101:1665–1671.

10. Fischer Q, Himbert D, Webb JG, et al. Impact of preexisting left bundle branch block in transcatheter aortic valve replacement recipients. *Circ Cardiovasc Interv*. 2018;11:e006927.

11. Szotek M, Drużbicki Ł, Sabatowski K, Amoroso GR, De Schouwer K, Matusik PT. Transcatheter aortic valve implantation and cardiac conduction abnormalities: prevalence, risk factors and management. *J Clin Med*. 2023;12:6056.

12. Bagur R, Rodés-Cabau J, Gurvitch R, et al. Need for permanent pacemaker as a complication of transcatheter aortic valve implantation and surgical aortic valve replacement in elderly patients with severe aortic stenosis and similar baseline electrocardiographic findings. *J Am Coll Cardiol Intv*. 2012;5:540–551.

13. Ozier D, Zivkovic N, Elbaz-Greener G, Singh SM, Wijeysundera HC. Timing of conduction abnormalities leading to permanent pacemaker insertion after transcatheter aortic valve implantation-a single-centre review. *Can J Cardiol*. 2017;33:1660–1667.

14. Glikson M, Nielsen JC, Kronborg MB, et al. 2021 ESC guidelines on cardiac pacing and cardiac resynchronization therapy. *Eur Heart J*. 2021;42:3427–3520.

15. Meguro K, Lellouche N, Teiger E. Cardiac resynchronization therapy improved heart failure after left bundle branch block during transcatheter aortic valve implantation. *J Invasive Cardiol*. 2012;24:132–133.

16. Jastrzębski M, Kiełbasa G, Cano O, et al. Left bundle branch area pacing outcomes: the multicentre European MELOS study. *Eur Heart J*. 2022;43:4161–4173.

17. Vela Martin P, Arellano Serrano C, Castro Urda V, et al. Left bundle branch pacing after transcatheter aortic valve implantation: initial experience of a center. *Eur Heart J*. 2022;43:ehac544.489.

KEY WORDS left bundle branch block, propensity score, transcatheter aortic valve replacement