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Commentary: Protecting the conduction system during transcatheter aortic valve replacement—the higher the better

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CENTRAL MESSAGE

Reducing conduction disturbances after TAVR with self-expanding valves ultimately depends upon understanding the position of the membranous septum and the need for a higher depth of implantation.

As transcatheter treatment of severe symptomatic aortic stenosis has evolved, so too has the scrutiny placed on implanters for the “perfect result.” Once a procedure with high complication rates, transcatheter aortic valve replacement (TAVR) is now considered “safer than surgery.”^{1,2} Conduction disturbances (CDs), new left bundle branch block, or need for permanent pacemaker implantation, are now the most common complications and are associated with worse outcomes.³ For TAVR to truly outperform surgical aortic valve replacement, the occurrence of CDs must be significantly reduced, particularly with self-expanding valve platforms.

In this issue of the *Journal*, Chen and colleagues present an analysis of the membranous septum (MS) length to optimize the depth of TAVR implant with self-expanding CoreValve and EvolutR devices.⁴ Building on previous work, they compared the MS length in the coronal view with the infra-annular MS length from the stretched vessel image.^{5,6} An implant depth (ID) of 3.7 mm, coronal MS length of 4.8 mm, and coronal Δ MSID of 3.2 mm were identified as optimal cutoff

points for prediction of CDs, with coronal Δ MSID or infra-annular Δ MSID the only modifiable predictors. In 12.8% of the cohort, there was no infra-annular portion of MS at all, a circumstance in which the MS would presumably be completely covered with high risk for developing a CD. Since no patient with MS length greater than 3.2 mm, including those with no infra-annular portion, required a pacemaker, the authors conclude “... pre-procedural assessment of MS length should be routinely adopted to determine the optimal ID to mitigate individual patient susceptibility to CDs after TAVR with self-expanding valves.”⁴ However, it must be noted that these findings were not used to guide the implants but instead were assessed retrospectively and, therefore, cannot explain the enviable 3.1% permanent pacemaker implantation and 16.4% left bundle branch block rates reported.

A detailed implantation technique, initiated with the first CoreValve deployment in 2013 and further modified with EvolutR, is described and presumed responsible for their outstanding results. The authors targeted an optimal ID of <5 mm and achieved a median ID 4.5 mm (interquartile range 2.5 to 6.0 mm), a depth relatively shallow compared with best practices at that time. Final positioning was further optimized by recapturing and repositioning as needed and limited postdilatation. The

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distance between the inflow edge of the TAVR frame and the aortic annulus at the noncoronary cusp defined the implant depth, which allowed for better appreciation of the position of the MS with more control of the depth at the non-right commissure.

However measured, patients with shorter MS length and ultimately smaller remaining presumably uncovered portion of the MS (septum length minus implantation depth) were found to be at greater risk for CDs. Yet, the methods used to obtain these more-sophisticated measurements seemingly mattered not nearly as much as the final depth of implantation in successfully mitigating the high rates of CD often seen with self-expanding valves. The key message then from this elegant work by Chen and colleagues seems simply to be to land the valve as high as safely possible.

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Commentary: Landing high, but not too high, yields fewer pacemakers after transcatheter aortic valve replacement

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Transcatheter aortic valve replacement (TAVR) is now commercially available for the treatment of severe aortic stenosis for all risk groups. Therefore, it is more important than ever to optimize clinical outcomes, considering the longevity of younger patients receiving TAVR. Conduction abnormalities including permanent pacemaker (PPM) and left bundle

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CENTRAL MESSAGE

Implanting the TAVR prosthesis higher (aortic) may reduce the need for permanent pacemaker, and preoperative imaging may guide us in certain patients more vulnerable for complete heart block.

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branch block are associated with increased hospitalization for heart failure, lack of improvement in left ventricular ejection fraction, longer intensive care stay, and mortality.^{1,2} The incidence of new PPM comparing the balloon-expandable SAPIEN 3 valve (Edwards Lifesciences, Irvine, Calif) was similar to surgery in the PARTNER 3 randomized trial.³ In