Touching the Membranous Septum: A Thin Line between Treating and Threatening?

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The article by Stachon et al. [1] is an important contribution because it highlights the impact of diverse calcification patterns on the conduction system of the heart after transcatheter aortic valve replacement (TAVR). In this regard, the cardiologists of the University of Freiburg performed focused multi-sliced computed tomography for the preprocedural assessment of valve morphology and the valve calcification status on the one hand, and the possible effects on an occasional – yet clinically critical – complication: “postprocedural AV block.”

The impact of aortic valve calcification (in particular, its volume, distribution and localization) has been investigated regarding the occurrence of high-degree AV conduction block and the consecutive need for postprocedural pacemaker (PM) implantation. Prior anatomical and electrophysiological studies showed the close topographic relation of the membranous septum to the atrioventricular node and the bundle of His, respectively [2, 3]. Likewise, the topographies of fundamental anatomical structures in the right-sided heart chambers, particularly within the triangle of Koch, have been very well described, the knowledge of which is the framework for established electrophysiological procedures such as slow-pathway ablations in patients with atrioventricular node re-en-

trant tachycardia. For instance, in the era of His bundle and left bundle pacing, this knowledge has proven useful [4–7].

In prior investigations pertaining the affection of the conduction system in the course of ablation and pacing procedures, alternative procedural access routes, such as left-sided access, have become popular [8, 9]. In these scenarios, the intraprocedural anatomical adjacencies to the right coronary and noncoronary cusps of the aortic valve have been of concern. Due to the anatomical proximity of the abovementioned anatomical structures, notably in TAVR, inherent procedural maneuvers entailing overstretching of the left ventricular outflow tract may cause accidental affection of the conduction system, as is commonly seen during balloon dilatation in TAVR.

This effect might become even more prominent with deeper implantation levels and oversizing of the implanted valve prosthesis, respectively [10]. Alas, in patients with relevant annular calcification, the risk of this effect is even tripled [11].

Commentary on Stachon et al. “Impact of Preprocedural Aortic Valve Calcification on Conduction Disturbances after Transfemoral Aortic Valve Replacement.”

In the setting of TAVR, in the light of procedural planning, calcification of the aortic valve is a boon and a bane: on the one hand, it can aid in adequate fixation of the prosthesis, whereas, on the other hand, conduction disturbances may lie in wait.

Bearing this in mind, the present study by Stachon et al. [1] focused on two substantial characteristics of annular valve calcifications: their shape and their orientation. Here, the main finding is that an evaluation of the orientation of calcification has more weight than an evaluation of its shape.

The rate of necessity of PM implantation due to AV block was increased when calcifications crossed the aortic annulus. In patients with this formation, AV block occurred within the first 2 days after TAVR. Even more interesting is the observation that the intensity of the effect on the conduction system seemed to correlate with the orientation of the annular calcification of the valve; in this regard, an orthogonal orientation of the annular calcification, as compared to its tangential orientation, was linked to an even fivefold higher probability of necessity of post-procedural PM implantation. In these cases of “jeopardizing” orthogonal annular valve calcifications, these were located on the contralateral side with respect to the conduction system (particularly below the left coronary cusp). As a hard tissue, the calcification remains in place even after TAVR. In fact, this calcific immobility, with its location in the region of the left coronary cusp, rather acts as a slider towards the region of the conduction system (located between the right coronary and the noncoronary cusp). Thus, one of the potential mechanisms of severe

AV conduction disturbances with consecutive necessity of PM implantation in patients with orthogonal annular calcifications could be an inferoseptal shift of TAVR, causing stress on the membranous septum with consecutive injury to the His bundle and/or the left bundle branch.

Although it is a small retrospective study, Stachon et al. [1] describe a novel mechanism of development of post-TAVR AV conduction disturbances. Without any doubt, for interventional cardiologists and physician teams in this context, a profound knowledge about these anatomical correlations of structures in the heart chambers is crucial for any procedural TAVR planning.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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