Catheter Ablation of Ventricular Arrhythmias in patients with Prior Mitral Valve Surgery: Challenging, but Feasible and Effective!

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Catheter Ablation of Ventricular Arrhythmias in patients with Prior Mitral Valve Surgery: Challenging, but Feasible and Effective!

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Catheter ablation is an effective treatment option for patients with ventricular arrhythmias including premature ventricular complexes (PVCs) and ventricular tachycardia (VT). Ventricular arrhythmias can be a source of significant morbidity and mortality in patients with mitral valve (MV) disease, including those who have undergone MV surgery such as valve repair or replacement. The incidence of sustained VT in this population tends to be bimodal occurring either in the postoperative period or years after valve surgery.[1,2] VT after MV surgery can have multiple mechanisms including bundle branch reentry or may involve circuits related to non-ischemic, operative, or ischemic scar.[1-3] Given the proximity of the mitral annulus to the left His-Purkinje system, bundle branch reentry predominates in the immediate postoperative period whereas scar based reentry typically presents years after operation.[1,2] Meanwhile, PVCs coexisting with MV disease can be idiopathic in nature, result from scar related to prior myocardial infarction or nonischemic process, or may also be related to arrhythmic mitral valve prolapse (MVP). In the lattermost context, PVCs originating from the papillary muscles or basal left ventricle (LV) may serve as triggers for polymorphic VT and ventricular fibrillation.[3] Catheter ablation in these patients with prior MV surgery may be associated with higher risk of procedural complications due to concern for increased risk of thromboembolism, catheter entrapment in MV prostheses, and possible increased risk of bleeding complications due to need for uninterrupted anticoagulation. Furthermore, the underlying arrhythmia substrates in patients with MV surgery remain poorly defined. While catheter ablation for VT has been shown to be safe and effective in patients with valvular heart disease who have undergone aortic valve replacement,[4] there has been limited data describing the

electrophysiologic substrates, mapping and ablation techniques, safety, and efficacy outcomes of PVC and VT ablation among patients with prior MV surgery.

In this issue of the *Journal of Cardiovascular Electrophysiology* , Khalil, Killu, et al. report the Mayo Clinic experience of 31 patients with prior MV surgery (24 with MV repair and 7 MV replacement [4 bioprosthetic, 3 mechanical]) who underwent catheter ablation for PVCs (n=15) or VT (n=16) over a 6-year period.[5] A total of 9 patients had ischemic cardiomyopathy and 9 patients had prior MVP. Ablation in the LV was performed via a transseptal (n=17) or retro-aortic (n=13) approach, with one patient treated with combined transseptal and epicardial approach. Consistent with prior series, presentation for PVCs and VT typically occurred years after surgery (median 3.4 years for PVC and 4 years for VT) and ablation was performed a median of 4 (for PVCs) and 5 (for VT) years after MV surgery. In nearly two thirds of patients, clinical arrhythmia was targeted at sites distant from the MV with the perimitral region being involved in only 6 patients with VT and 5 with PVCs, and perimitral scar was seen in 45% of the PVC group and 50% of the VT group. Ablation was acutely successful in 94% of the VT group and 93% in the PVC group, with only 2 patients having acute procedure failure (1 VT patient with hemodynamically unstable VT requiring percutaneous LV assist device with presumed epicardial isthmus in whom percutaneous epicardial access was not attempted in the setting of prior sternotomy, and 1 PVC patient with LV summit PVC which failed due to proximity of site of origin to the left anterior descending artery). There were no procedural complications reported (including no catheter entrapment and no significant change in MV function before versus after ablation). Over a median follow up duration of 478 days, survival free from recurrent ventricular arrythmia was achieved in 72% (67% VT, 78% PVC).

This results of this study suggest that when performed by experienced and skilled operators, catheter ablation for PVCs and VT in patients with prior MV surgery can be a safe and effective treatment option. These challenging procedures can be quite time-consuming (mean total procedure duration and energy delivery time of 299 minutes and 64 minutes for VT; 255 minutes and 21 minutes for PVC) and may require relatively high amounts of fluoroscopy (mean fluoroscopy time 36 minutes for VT and 28 minutes for PVC), but ultimately acute and long-term procedural success can be achieved in the majority of patients.

As has been mentioned by the authors in the manuscript, several issues can make catheter ablation more complicated and challenging in these patients. First, in patients with prior valve surgery, percutaneous epicardial access can be prohibitive due to presence of extensive pericardial adhesions. As such, one should consider having a cardiac surgeon readily available on backup support in case complications of percutaneous epicardial access are encountered, or to permit conversion to surgical epicardial access if percutaneous access cannot be obtained. Importantly, mapping via the coronary venous system and its branches should be considered in all patients with suspected epicardial or intramural substrates, especially those with perimitral substrate, as often perivalvular substrates can be targeted with ablation from the coronary venous system directly, or with ablation from adjacent chambers via an anatomic approach. Management of pre-, intra-, and post-procedural anticoagulation is of critical importance particularly in patients with mechanical MV replacement, in whom procedures should be performed on uninterrupted anticoagulation. While hemostasis was achieved using manual compression in all patients in the authors' series, we have found the use of vascular closure devices (Perclose ProStyle; Abbott, Chicago, IL) to be especially helpful to achieve hemostasis for both arterial and venous accesses, negating the need for protamine reversal, permitting continued uninterrupted anticoagulation, and facilitating early ambulation. Additionally, pre-procedural imaging such as transesophageal echocardiogram, cardiac computed tomography angiography, or intracardiac echocardiography (ICE) should be considered in all patients with atrial fibrillation to exclude presence of left atrial thrombus, especially if a transseptal approach is being considered. While ICE views can be limited due to substantial echo-artifact from prosthetic material (especially in patients with mechanical MV replacement), ICE remains an extremely helpful tool to guide mapping and ablation in these patients, and to avoid complications particularly when manipulating the ablation catheter near mitral valve prostheses. Also, color Doppler of the MV should be performed intraoperatively during periods of acute hypotension as well as at the end of the procedure to assess MV function. Finally, multipolar catheters (especially circular multielectrode mapping catheters) should be avoided near the MV apparatus to avoid catheter entrapment which

could result in catastrophic consequences. The series does not include all possible scenarios after MV surgery and no patients with dual mechanic valves in the aortic and mitral position were included. These are the most challenging patients with prior MV surgery where the typical access route to the LV is not possible and alternative strategies such as transapical or trans-ventricular septal (or right atrial to LV) access may be necessary.[6-8] Another intriguing question that is not answered in this series is the potential role of surgery in the setting of bileaflet MVP to reduce arrhythmia burden. While the authors did not report in this series the incidence of ventricular arrhythmias before versus after MV surgery in those patients with MVP, prior small retrospective studies (including data from the authors' group) have suggested that MV intervention might reduce incidence of ventricular arrhythmias, both in the setting of bileaflet MVP as well as in those with mitral regurgitation in the absence of MVP.[9-11] However, this hypothesis remains to be confirmed in larger prospective studies.

We applaud the authors for sharing their institutional experience describing techniques and outcomes of VT and PVC ablation in this challenging patient population with prior MV surgery. This study is a welcome addition to the literature demonstrating that LV ablation for both PVCs and VT in patients with prior MV repair and replacement can be performed both safely and effectively by experienced operators. Their findings support the notion that catheter ablation should not be withheld as a possible treatment option solely based on history of prior MV surgery. Referral to a tertiary ablation center for management can be considered, especially in more complicated, higher-risk cases.

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