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COMMENTARY

Catheter ablation as first-line therapy for ventricular tachycardia: is it time for a paradigm shift?

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Ventricular tachycardia (VT) is the electrophysiological manifestation of abnormal myocardial remodeling in the setting of complex ischemic, non-ischemic, or mixed substrates. Despite the fact that a majority of large referral centers have reported encouraging outcomes in patients undergoing catheter ablation (CA) for VT, prospective evaluations have been lacking due to the complexities of ventricular arrhythmias and diversity of the population being studied. Specifically, there has been uncertainty surrounding the role of early CA for patients with a first presentation of VT. For these patients, it is unclear whether CA prior to implantable cardioverter defibrillator (ICD) placement is more effective than a more traditional therapy of ICD placement and antiarrhythmic medications.

Fortunately, there have been several encouraging investigative efforts in the recent years which have shown that early CA is a reasonable management option for patients with VT. PARTITA was a randomized controlled trial comparing medical therapy to CA in patients after their first ICD shock. The trial showed that ablation was associated with marked reduction in appropriate ICD shocks for VT although notably most patients had an ischemic cardiomyopathy, which is generally associated with better outcomes from CA [1]. PAUSE-SCD compared CA as a first-line therapy to patients with sustained VT before they underwent ICD implantation. This randomized controlled trial was unique in the substantial number of patients enrolled with non-ischemic substrates including arrhythmogenic right ventricular cardiomyopathy (ARVC). The investigators of PAUSE-SCD demonstrated that CA as first-line therapy reduced recurrent VT and appropriate ICD therapies [2]. Both PARTITA and PAUSE-SCD demonstrated favorable outcomes in regards to VT recurrence but failed to show any reduction in mortality. A recent meta-analysis by Prasitlumkum et al., incorporating nine randomized trials, including PARTITA and PAUSE-SCD, demonstrated the effectiveness of early CA in reducing recurrent VT and ICD shocks. Two notable limitations were that the majority of patients in that pooled cohort had ischemic cardiomyopathy and the meta-analysis failed to show any significant reduction in mortality with early CA [3].

In this issue of the *Journal of Interventional Cardiac Electrophysiology*, Kotake et al. report on the feasibility and outcomes of CA as first-line therapy for VT [4]. The authors have conducted a retrospective study of patients presenting with sustained VT who were scheduled to get secondary prevention ICD. Among the 184 patients studied, 34 received CA for VT before the ICD implantation, and the remaining 150 patients received an ICD and antiarrhythmic medications. The authors report that these groups were fairly similar except for the baseline left ventricular ejection fractions, which were lower in the antiarrhythmic medication group and the frequency of VT storm at presentation, which was higher in the ablation-first group. A unique feature of this study was that a majority of the patients (54%) had non-ischemic cardiomyopathy. CA procedures were performed using Biosense Webster's mapping system exclusively, and a median of two VT morphologies were induced at the time of ablation. Acute success was defined as elimination of all VT morphologies which was achieved in 62% of the patients undergoing CA, and partial success was defined as elimination of at least one VT morphology which was achieved in the remaining 38% of the patients undergoing CA. Approximately 9% of these patients experienced peri-procedural complications which included an anticipated instance of atrioventricular block following basal septal ablation, an instance of groin hematoma, and a pericardial effusion without the need for drainage. There were no peri-procedural deaths. The authors report that the primary endpoint of survival free from VT and off antiarrhythmic medications was higher in patients undergoing CA as first-line therapy. The

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secondary endpoint of survival free from a composite of VT, cardiovascular hospitalization, death, and heart transplant was also improved in the ablation-first group. These differences reached statistical significance and remained unchanged when patients with VT storm were excluded. Interestingly, despite showing consistent results among patients with both ischemic and non-ischemic substrates, a subgroup analysis revealed that the secondary endpoint was only different in patients with non-ischemic substrates receiving CA as first-line therapy. With further analysis, the authors report that the only factor that was independently protective against recurrent VT was first-line CA, representing an 80% reduction in the risk of future VT episodes.

Kotake et al. have compiled a valuable series of patients with sustained VT using real-world data. Most importantly, they have incorporated a representative number of patients with both ischemic and non-ischemic cardiomyopathies. The patients undergoing CA had meticulously planned procedures, which included rigorous programmed electrical stimulation protocols performed before and after ablation was performed. On the other hand, the retrospective and non-randomized nature of this study makes the results prone to biases that are not easily controlled for despite effective statistical analyses. As the group undergoing ablation first was at the discretion of the treating physician, there is some inherent different that is expected between those treated without ablation. Such a difference may not be quantifiable using the parameters included here. The authors have discussed these limitations and have reported their efforts to minimize their influence on the final outcomes of the study. One other factor that stands out is the effect of the baseline left ventricular ejection fraction, which was higher in patients undergoing CA as first-line therapy and could have set that group up for favorable outcomes. Also, the subgroup analysis comparing patients with ischemic and non-ischemic cardiomyopathy goes against published literature from randomized controlled trials like PAUSE-SCD where patients with non-ischemic cardiomyopathy had less favorable outcomes [2]. This raises questions about the underlying substrates involved in the patients with non-ischemic cardiomyopathy included in this study. It is conceivable that if a number of patients in this group had VT of benign origin like outflow tract VT or VT associated with papillary muscles in the absence of structural heart disease, the results after CA would be favorable. The same is true if a subset of these patients had undiagnosed ARVC who were shown to do well after CA in PAUSE-SCD [2]. This observation also related to the low use of epicardial ablation in the ablation-first group despite the fact that a majority of the patients in that group (62%) had non-ischemic substrates.

Despite the limitations of this study, the authors are to be commended for their work toward addressing this important question. With the advancements in three-dimensional mapping and ablation technologies, it is imperative to investigate whether CA can be employed as first-line therapy for VT. Real-world experience with VT management has shown how difficult it can be to conduct a prospective randomized trial in this population. In addition to the challenges of comparing patients within a diverse and often critically ill population, those presenting to high-volume referral centers are frequently considered to be highly likely to benefit from CA, making it challenging to establish the true equipoise necessary for a randomized study [5]. This data further emphasizes the importance of larger multicenter randomized controlled trials that are powered to delineate the efficacy of early CA for VT and whether such strategy has any impact on mortality and similar hard clinical endpoints. Until then, the decision to perform such procedures as first-line therapy requires an individualized approach to patients presenting with VT where many factors influence the therapeutic strategy.

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Declarations

Conflict of interest TM has served as a consultant for Medtronic and has received speaking fees from Boston Scientific. MM has nothing relevant to disclose.

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