EDITORIAL COMMENT

Integration of CMR Scar Imaging and Electroanatomic Mapping
The Future of VT Ablation?*

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In this issue of *JACC*, Gupta et al. (1) present their single-center experience with intraprocedural 3-dimensional registration of cardiac magnetic resonance (CMR) scar mapping with voltage maps created at the time of ablation of ventricular tachycardia (VT) or premature ventricular contractions (PVCs) in 23 post-infarction patients. The methodology involves using 3 standard landmarks—the aortic root, mitral annulus plane, and left ventricular apex—to integrate voltage and scar maps, which allows more focused mapping of VT in areas with scar. Although there is previous experience with post hoc integration of CMR scar and voltage maps (2–5), the novel feature of this contribution is the use of this methodology to guide the VT ablation procedure. At the same time, the study raises several questions. First, is this methodology likely to improve the efficiency and success rates of VT ablation in the future? Second, does this methodology have the potential to be applied broadly to most patients undergoing VT ablation? Third, are there other imaging techniques likely to be more effective or more broadly applicable for patients undergoing VT ablation?

The rationale for the use of CMR for VT ablation in post-infarction patients is based on the relationship between scar and ventricular arrhythmia. VT often occurs in patients with healed myocardial infarctions because slow conduction through surviving myocytes in and around the infarction facilitates reentry, the usual mechanism of sustained post-infarction VT. The exit site for these reentrant VTs is usually located along the border zone of the scar (6). Nonsustained VT and PVCs also occur and may come from the infarct zone, although multiple mechanisms are possible for isolated PVCs, including enhanced automaticity, triggered activity, and localized reentry.

The distribution of myocardial scar is of interest during the ablation procedure because post-infarction VT usually arises from myocardial scar. Infarction appears bright on CMR late gadolinium–enhanced imaging, giving a clear delineation of the infarct size, borders, and transmurality. Although CMR assesses the full extent of scar, endocardial electroanatomic mapping (EAM) may be less sensitive to scar involving the midwall or subepicardium only. For example, a significant difference in bipolar voltage between endocardial versus intramural and epicardial scar (0.94 ± 1.07 mV vs. 1.52 ± 1.41 mV; p < 0.01) has been described (2). Fortunately, because post-infarction scars usually involve the subendocardium, endocardial EAM should effectively identify areas with myocardial infarction. In fact, pathological studies have shown that infarct size from bipolar EAM voltages of ≤1.0 mV highly correlate with infarct size on the basis of pathology (r = 0.98; p = 0.0001) (7).

In this way, the rationale for the use of CMR in the context of EAM for VT ablation is that more accurate identification of scar and thus critical ablation sites can be achieved more efficiently. Unfortunately, no conclusions can be made from Gupta et al. (1) with respect to relative efficacy due.

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REFERENCES


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