

Pericardial Space Exploration for Ventricular Tachycardia Mapping: Should the Countdown Begin?

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Ablation of ventricular tachycardia using radiofrequency energy is frequently successful. This includes ablation of right ventricular outflow tract tachycardia, idiopathic left ventricular tachycardia, ventricular tachycardia due to macroreentry involving the bundle branches, and ventricular tachycardia in the setting of ischemic and nonischemic cardiomyopathies.¹ Mapping of ventricular tachycardia requires the use of one or more of the following techniques: pace mapping, "P potentials" for some left ventricular tachycardias, early ventricular activation, concealed entrainment, localization of isolated mid-diastolic potentials, and continuous electrical activity.^{1,2} Results from surgery suggest that ventricular tachycardia circuits may involve the epicardial surface, and this involvement may be responsible for unsuccessful localization and cure in some patients.³ These data imply that failed attempts at catheter ablation of ventricular tachycardia may sometimes be due to inadequate mapping, inadequate lesion size, or to an epicardial circuit and the inability of endocardial application of radiofrequency energy to create an epicardial lesion. Perhaps techniques are needed to map the epicardium to guide radiofrequency ablation of ventricular tachycardia. In this issue of the *Journal of Cardiovascular Electrophysiology*, Sosa et al.⁴ describe a new technique for mapping the epicardium.

Sosa et al.⁴ describe a technique of epicardial mapping of ventricular tachycardia with standard electrophysiologic catheters performed utilizing a pericardial puncture in three patients with Chagas' disease. This technique is novel and may provide an approach not only to epicardial mapping, but

potentially to epicardial ablation of ventricular tachycardia. The pericardial puncture technique was utilized in three patients as a mapping tool, and epicardial involvement of the ventricular tachycardia was observed in one patient. This technique's potential use is likely to be only in the setting of reentrant ventricular tachycardia due to an ischemic or a nonischemic cardiomyopathy, because of the excellent results observed with current ablation techniques for ventricular tachycardia in other settings.^{1,2} Furthermore, the limitations of this technique need to be considered before one could consider its use either alone or in conjunction with radiofrequency catheter ablation.

The first and second obvious concerns are the small number of patients studied and the potential risks involved with a pericardial puncture. While no complications were noted in this study, only three patients underwent the procedure for epicardial mapping of ventricular tachycardia. In the presence of significant fluid, a pericardial puncture is straightforward, although significant complications can occur. Intuitively, a pericardial puncture of a "dry" or normal pericardial space would seem to be difficult and time consuming. The risk of infection, pain, pericarditis, myocardial injury, inadvertent damage to the coronary arteries, and the risk of other complications during a pericardial puncture, in the absence of pericardial fluid, could be significant and need to be assessed. These authors reported that manipulation of the epicardial catheters was without difficulty and not associated with complications. However, catheter manipulation could theoretically result in damage or spasm of the epicardial coronary arteries. Finally, if this technique is used to guide epicardial applications of radiofrequency energy, significant injury to the coronary arteries or the pericardium could occur. These complications could be potentially serious and life threatening.

Pericardial puncture and cannulation provide a transcatheter approach to epicardial mapping of ventricular tachycardia. Is one needed? This

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technique is unlikely to be used for ablation of idiopathic ventricular tachycardia, which is associated with success rates approaching 100%.^{1,2} Sosa et al.⁴ found epicardial involvement of the ventricular tachycardia circuit in one of three patients studied. The authors used this technique only as a diagnostic tool and did not include a therapeutic experience. Perhaps endocardial application of radiofrequency energy would have resulted in successful ablation in each of the three patients, including the patient in whom an improved mapping site at the epicardial surface was observed. Current success rates for endocardial mapping and radiofrequency ablation of ventricular tachycardia ablation in the setting of an ischemic or non-ischemic cardiomyopathy is approximately 85% when the ventricular tachycardia can be mapped (University of Michigan, unpublished experience). Failure of endocardial ablation in the remaining 15% of cases may be due to inadequate mapping, inadequate lesion size for a nonepicardial circuit, or inability to create an epicardial lesion. Preliminary data with cooled-tip and large-tip radiofrequency energy catheters suggest that these catheters can create large and potentially transmural lesions when applied to the endocardial surface. These catheter designs may result in improved success rates for ventricular tachycardia ablation, even with the weaknesses of current ablation and mapping techniques, and obviate the need for transcatheter epicardial mapping and ablation. Given the high success rates of endocardial mapping and ablation techniques, epicardial mapping and transcatheter applications of radiofrequency energy for ablation

appear to be of minimal clinical value and may be dangerous.

In summary, Sosa et al.⁴ present a new technique to map ventricular tachycardia using an epicardial approach with standard catheters via a pericardial puncture. The potential risks of this procedure are substantial, and current endocardial ablation techniques offer good success rates that are likely to improve with the use of new catheter designs. Therefore, pericardial space exploration for epicardial mapping of ventricular tachycardia is unlikely to have a significant clinical impact.

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