Epicardial Ablation in Post–Myocardial Infarction Ventricular Tachycardia
Could It Be One of the Missing Pieces of the Puzzle?

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Since its first description by Sosa et al., catheter-based epicardial ablation has been increasingly used for catheter ablation of ventricular tachycardia (VT) due to a variety of substrates. It has been recognized that in idiopathic dilated cardiomyopathy, an epicardial origin is frequent and amenable to ablation in some cases. More recently, similar findings were described in arrhythmogenic right ventricular cardiomyopathy. 

However, the situation in VT related to chronic myocardial infarction (post-MI VT) seemed different. The surgical experience having a high success rate with subendocardial resection spoke for a subendocardial location of the VT substrate. The initial series of catheter-based VT ablation, involving well-tolerated VT ablated endocardially based on VT mapping during tachycardia, showed a relatively high acute success rate. However, VT recurrences were common. The introduction of the concept of substrate ablation, based on locating the VT substrate during sinus rhythm, has expanded catheter ablation to a larger number of VT patients, with reasonably good acute results, but the recurrence rate is still high. It has been suggested that this high recurrence rate could be related to a modification of the substrate over time because of the remodeling process, but this has never been demonstrated and the fight for an improvement in results continues.

In this issue of the journal, Izquierdo et al searched in a different direction. What if the substrate, although partially endocardial, involves subepicardial or epicardial areas as well? What if our endocardial lesions are not deep or large enough to permanently damage the VT substrate and epicardial ablation improves clinical results? To explore on such a hypothesis, they performed both endocardial and epicardial mapping and eventual ablation in a consecutive series of 15 patients with post-MI VT undergoing their first ablation procedure (endo-epi group). These patients were compared with a relatively heterogeneous group of 35 patients, who underwent exclusively endocardial mapping and ablation (endo-only group) because the procedure was performed before a certain date (when they started the combined approach), because they had undergone cardiac surgery in the past precluding a percutaneous pericardial access, or because of physician preference (less experienced operators). However, both groups seemed to be comparable except for the higher incidence of previous cardiac surgery in the endo-only group, as expected. There were some complications related to the epicardial approach, and the acute results (rate of complete or partial success in VT suppression) were similar. However, clinical outcome was better in the endo-epi group, with a tendency toward a lower recurrence rate (46% in the endo-only group versus 20% in the endo-epi group) and a significantly lower incidence of a combined end point of hospital/emergency admission because of VT or need for reablation (40% in the endo-only group versus 7% in the endo-epi group). Total mortality also trended favorably in the endo-epi group (31% in the endo-only group versus 7% in the endo-epi group). Looking into the data with more detail, 2 findings seem surprising.

The first surprise is that in the majority of patients of the endo-epi group (13 of 15; 87%), an epicardial substrate that met criteria for substrate ablation (late potentials) was present. Previous studies have suggested a different picture in post-MI VT. Groups that performed initially an endocardial approach found that endocardial ablation was acutely successful in the majority of patients, requiring an epicardial approach in only 9%. Other series, approaching the epicardium based on more flexible criteria, increased this proportion to 16%. In a small series of 17 patients, epicardial mapping was undertaken in 7 patients, but a substrate that required epicardial ablation was found in only 3 (18%). However, a more recent report from this same group allows an estimation of this proportion of 29%. So overall, it seems that the more the epicardium is looked at, the more it is ablated.

The second big surprise is that despite an absence of difference in acute results, the endo-epi group had better clinical outcome. In absolute numbers, the endo-only group recurrence rate (46% in a little over 1 year of follow-up) is similar to what has been found in larger series of endocardial VT ablation. The surprise is the low recurrence rate in the endo-epi group. However, this is not the first study with these findings. In a series that included 72 patients with post-MI VT, with epicardial ablation in 21 and endocardial ablation only in the remaining 51, both groups achieved similar acute complete or partial success (>90% in both groups), but 85% of the former and 56% of the latter were arrhythmia free at 12 months. In a somewhat different approach and patient population, in
patients with electrical storm, it was found that endo-epicardial scar homogenization (epicardial ablation in 33%) resulted in 19% recurrence rate when compared with 47% recurrence rate with the conventional endocardial approach.16

Are the results of Izquierdo et al11 convincing enough to adopt their experimental approach? More information is certainly needed before this question can be positively answered because the study has several limitations and potential sources of bias.

1. The design is not randomized.
2. The sample size is really small: the group with the novel approach of routine endo-epicardial mapping, is only 15 patients.
3. The endo-only patients are historical controls; it cannot be excluded that in the more recent endo-epi group, technical improvements over time and the larger experience of the team have contributed to the better results observed.
4. Patients with prior coronary surgery are not excluded, but added to the endo-only group because in them, the approach was purely endocardial. However, these patients seem to be sicker because their mortality was higher. To account for this limitation, the authors performed a separate analysis excluding the surgical patients: this analysis trended similarly, but statistical significance was lost.
5. The authors do not offer a clear explanation for the observed results. The endocardial ablation time was longer for the endo-only group, suggesting larger scars/substrate in this group. The trend toward a lower recurrence rate in the endo-epi group did not reach statistical significance. What was significantly different was the readmission rate because of VT and re-ablation. The authors emphasize that several of these recurrences were slow VT that went undetected by the implantable cardioverter-defibrillator. It is intriguing to speculate that endocardial ablation produced lesions that were acutely successful but chronically not deep enough to permanently block conduction. Instead, they slowed it down in deeper (subepicardial?) areas of reentrant circuits that were still viable.

Despite the above limitations, the authors have to be congratulated for their effort to undertake a systematic approach of mapping both endocardium and epicardium in a consecutive series of patients with post-MI VT undergoing their first ablation attempt. Their results are encouraging and hypothesis generating. This study certainly opens the field of VT ablation to explore in a more systematic way the epicardium. However, because the epicardial approach is not without risk, additional studies with larger number of patients and longer clinical follow-up are needed to establish the role of an epicardial approach in catheter ablation of post-MI VT.

Disclosures
Dr Almendral has received honoraria for presentations from St Jude Medical and Boston Scientific.

References
◼ catheter ablation
◼ endocardium
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